Heating Piping & Air Conditioning

OCTOBER 1956

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INDUSTRIAL • COMMERCIAL • INSTITUTIONAL • PUBLIC BUILDINGS

Journal Section of the American Society of Heating and Air-Conditioning Engineers—p. 117

Training for pipe fitter apprentices and instructors is being stressed in stepped-up program to meet need for higher skills.....page 86

GRINNELL GAS-FIRED UNIT HEATERS

Grinnell
Available in 7 sizes — with input ratings from 25,000 to 200,000 Btu's
All parts readily accessible for periodic servicing.

Approved by the American Gas Association and listed by Underwriters' Laboratories, Inc.

This Grinnell unit heater — burning all types of gases — is built to provide efficient, dependable service even under severe conditions. Typical of the interiors for which this gas-fired unit heater assures clean, constant heat are: factories, repair shops, garages, warehouses, stores and supermarkets.

- **efficient performance:** Assured by modern design of burners and heat exchanger, proper motor and fan unit.
- **effective air distribution:** Motor and fan unit delivers maximum air volume at maximum efficiency with minimum noise; louvers are individually adjustable.
- **instantaneous heat:** Full rated capacity obtained in 18 seconds from a cold start.
- **no danger of gas escaping:** Automatic safety pilot operates to shut off gas supply if pilot burner goes out.
- **no flashback, no extinction noise:** Prevented by the burners' raised port design and proper port size for the particular gas used.
- **overload protection:** The low speed motors have built-in thermal overload protection and automatic reset.
- **summer air circulation:** Summer-winter switch permits use of fan for air circulation during warm weather.
- **easy suspension:** Threaded pipe hangers are integral parts of the heater.
- **complete wiring:** Unit requires only connection to suitable room thermostat or manual switch.
- **easy maintenance:** All parts are readily accessible for periodic servicing; hinged bottom pan permits cleaning interior of tubes; burners and control assembly are removable as a unit.
- **durable construction and finish:** Housing die-formed of heavy, stretcher-level steel and finished with heat resistant, baked-on enamel; combustion chamber of heavy steel, welded tubes and draft diverter of aluminized steel; burners of close-grained iron castings.

Available from your local distributor

GRINNELL

WHENEVER PIPING IS INVOLVED

Grinnell Company, Inc., Providence, Rhode Island • Coast-to-Coast Network of Branch Warehouses and Distributors

Manufacturer of: pipe fittings • welding fittings • forged steel flanges • steel nipples • engineered pipe hangers and supports Thermolier unit heaters • Grinnell-Saunders diaphragm valves • prefabricated piping • Grinnell automatic fire protection systems

there must be a reason why

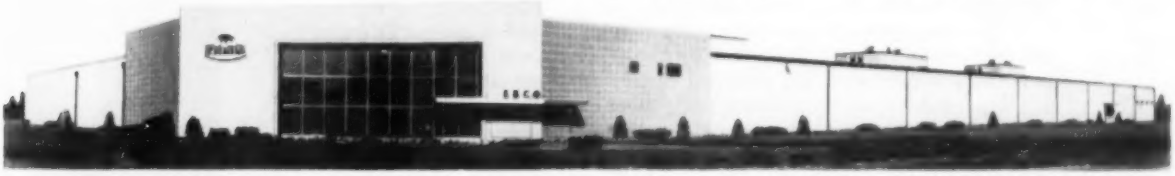
more usAIRco RK's cool the nation's finest buildings

than all other self-contained central systems combined!

AAA BUILDING, Kalamazoo, Michigan. Architect: Louis C. Kingscotts & Associates; Mechanical Contractor: Miller-Davis Plumbing and Heating; Refrigeration Contractor: Tony's Refrigeration. RK 30.

SEARS, ROEBUCK STORE, Logan Square Shopping Center, Norristown, Pennsylvania. Architect: Herbert Anderson; Installing Contractor: Clermont Engineering Co., Inc.; General Contractor: Irwin & Leighton Co. One RK 50, one RK 40, one RK 30.

PARKE-DAVIS PHARMACEUTICAL MANUFACTURING CO., Detroit, Michigan. Anti-polio vaccine production laboratories. Architect: Parke-Davis; Contractor: Jack Cooley Co.; Mechanical Contractor: Gass Plumbing and Heating. DRK 60.



EBCO MANUFACTURING CO., Columbus, Ohio. Architect: Merle R. Mafft; Contractor: F & Y Building Service, Inc. Twelve DRK 50, one DRK 30.

INTERNATIONAL LATEX CORP., Newnan, Georgia. Installing Contractor: Lindsey Electric Co. Two RK 15, one RK 60.

COMMUNITY BANK, Burbank, California. Architect: Killingsworth, Brady & Smith; Engineers: Thompson Engineering Co.; Contractor: Air Comfort, Inc. RK 25.

KROGER FOOD STORE, Detroit area; 30 stores. Equipment installation designed and engineered by Kroger Company. RK 30's.

Opportunity!

Be a *manufacturer's representative* for usAIRco, and profit from the sky rocketing acceptance RK's are receiving as a result of aggressive promotion. Write today, giving a brief resume of your background, to Robert P. Kelley, sales manager. An interview will be arranged if your territory is available.

KORVETTE CITY SHOPPING CENTER, Long Island, New York. Architect: Scheiner & Swift; Contractor: Uman Construction Co. Two RK 50; two RK 40, in main department store.

UNITED STATES AIR CONDITIONING CORPORATION

7900 Tabor Road, Philadelphia 11, Pennsylvania

usAIRco
10 YEARS OF AIR CONDITIONING

1899 Wrought iron pipe was installed in City Hall in 1899. Services: steam returns, soil, waste and vents, and cold water piping 4" and over.

1910 Pennsylvania Station was built in 1910. Wrought iron pipe was installed in steam supply lines, soil, waste, vents, leaders, and cold water lines.

These New York City buildings tell an important story about Wrought Iron Pipe *cost-per-year*

Because *cost-per-year* is the only logical guide to economical pipe selection, service-life records are a vital factor.

What about wrought iron pipe *cost-per-year?* A typical answer is found in the service-life records illustrated by these New York City buildings. The maintenance-free operation provided by wrought iron since installation date is a dependable index to the material's lower cost-per-year of service.

If you are planning a new building, our bulletin, *Piping for Permanence*, will help you with any questions you have about wrought iron pipe, and its ability to save because it serves longer. Write for a copy.

A. M. Byers Company, Pittsburgh, Pa. Established 1864. Boston, New York, Philadelphia, Washington, Atlanta, Chicago, St. Louis, Houston, San Francisco. International Division: New York, N. Y. *Available throughout the world.*

1912 Woolworth Building, 1912. Wrought iron pipe in soil, waste, vents, some cold water risers, branch lines, and steam supply, condensate returns.

1931 Irving Trust Company Building was built in 1931. Wrought iron pipe was installed in the steam return lines and all vents.

1913 Municipal Building was built in 1913. Wrought iron pipe installed in steam returns, soil, waste and vents, and cold water piping 4" and over.

BYERS *Wrought Iron Tubular and Hot Rolled Products*

ALSO ELECTRIC FURNACE QUALITY STEEL PRODUCTS

Heating Piping & Air Conditioning

Vol. 28 No. 10

(with which is merged the Aerologist)

DESIGN, INSTALLATION, OPERATION AND MAINTENANCE IN INDUSTRIAL, COMMERCIAL, INSTITUTIONAL AND PUBLIC BUILDINGS

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Published monthly by the Keeney Publishing Co., 6 N. Michigan Ave., Chicago 2, Ill. Telephone: STate 2-6916. Subscriptions: U.S. and possessions, $3.00 per year; Canada, Cuba, Mexico, Central America, South America, $4.00 per year; other, $6.00. Current copies, U.S. and possessions, 35c each; back copies, 60c each. January 1956 issue out of stock. For change of address, notify publisher and your local postoffice of both old and new addresses by the 8th of the preceding month. Member Audit Bureau of Circulations, Associated Business Publications, Inc., and Magazine Publishers Association, Inc. Heating, Piping & Air Conditioning is indexed regularly by Engineering Index, Inc., and Industrial Arts Index and is microfilmed by University Microfilms. ©1956 by the Keeney Publishing Co. Entered as Second Class Matter May 18, 1929, at the Post Office at Chicago, Ill., U.S.A. under the Act of March 3, 1879. Additional entry at Mendota, Ill.

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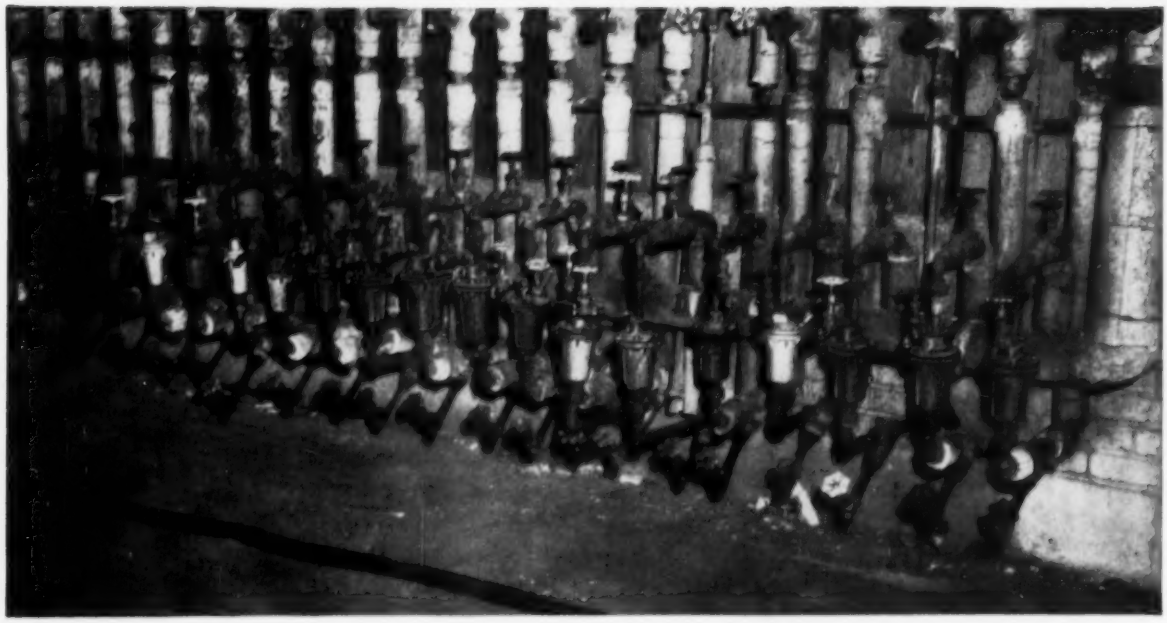
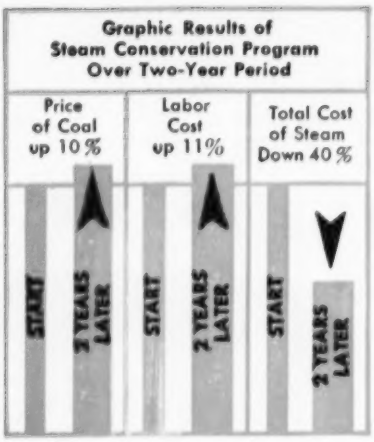
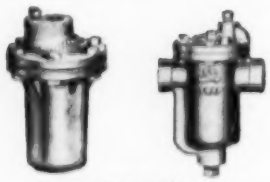
How a Major Chemical Company Cut Steam Costs $100,000 Annually







Trap sizes and styles
for every condensate drainage job.

Armstrong Traps were a "Major Factor" in Steam Conservation Says Chief Engineer

Steam waste has a way of creeping up on you. Especially in older plants. The losses can make a staggering total.

Plants looking for a way to fight rising costs can well take a page from the 8-point steam conservation program that netted a major chemical plant $100,000 annual saving:

1. **Waste steam utilized** — all flash steam recovered for building heating.
2. **New steam traps installed** — Armstrong traps replaced old traps throughout the plant, indoors and out.
3. **Steam leaks repaired.**
4. **Insulation repaired.**
5. **All condensate recovered.**
6. **Steam piping simplified.**
7. **Steam turned off when not needed.**
8. **Preventive maintenance improved** to insure a continuous checkup on sources of waste.

In commenting on the program, the Chief Engineer of the plant stated, "*4000 new Armstrong steam traps were one of the major factors in conserving steam. The traps, plus improved installation practice, have reduced annual trap maintenance parts and labor by $25,000 as compared to traps previously used.*"

Want all the facts? Tips on cost-saving standardized trap hookups? Facts about Armstrong traps? Ask for:

1. The No. 1, 1956 issue of the Armstrong Trap Magazine containing complete details, drawings and photos.
2. The 44-page Armstrong Steam Trap Book, a fact-full guide to better trapping.

Call your local Armstrong Representative or write:

ARMSTRONG MACHINE WORKS
874 Maple St., Three Rivers, Michigan

ARMSTRONG STEAM TRAPS

"WHAT? FAR-AIR filters pay for themselves in 18 months?"

"Yes, sir. Many users report FAR-AIR filters save 75% of their original cost every year, too!"

"How come?"

"For one reason, they handle 50% more air than 'bargain brands,' so it takes 1/3 fewer filters to do the job."

"Yes, but they cost more."

"True, but you buy them only once—not over and over."

"It costs money to clean them."

"...but they hold 50% more dirt, last longer between cleanings and clean easier, so maintenance cost is 'way down."

"In fact, FAR-AIR filters will save you enough over 'cheap brands' to pay for your original filter investment many times over."

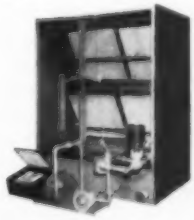
"You prove that and I'll buy!"

"Yes, sir, we'll start a test in your plant tomorrow."

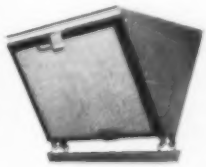
If you would like a demonstration of FAR-AIR savings in *your* plant under *your* operating conditions, write or wire for a free evaluation test. You'll be glad you did!

Typical **FAR-AIR** *Products*

1", 2" and 4" Thick Panel Filters



Self-Washing Filter



Grease Eliminator

FARR COMPANY

LOS ANGELES • NEW YORK • CHICAGO • NEW ORLEANS

Manufacturing Licensees:
Farr Company Mfg. Ltd.
Montreal, Canada
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Sydney, Australia
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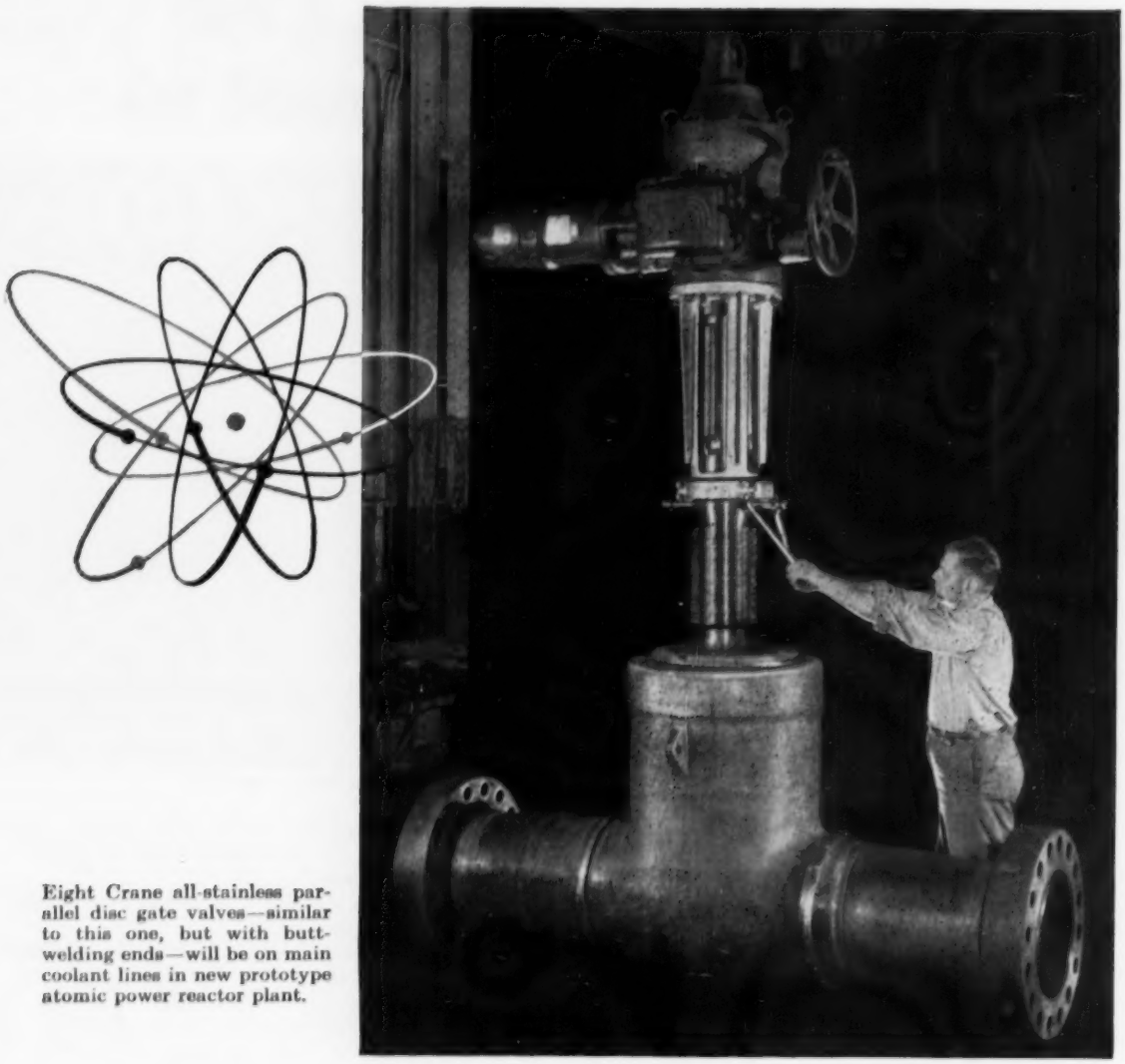
Originators of **FAR-AIR** *Certified Filter Service*



Eight Crane all-stainless parallel disc gate valves—similar to this one, but with butt-welding ends—will be on main coolant lines in new prototype atomic power reactor plant.

AGAIN... Crane leads the way in flow control for atomic power

As the age of atomic power unfolds and expands, Crane continues to lead the way in flow control.

Crane equipment is already playing an important role in the mighty *Nautilus* and *Seawolf*—the Navy's celebrated atomic-powered submarines.

Now Crane valves are ready to make history again in the peaceful use of atomic energy—in the nation's first land-based atomic power plant.

Eight Crane stainless steel gate valves—similar to the one shown above—will be on the main coolant lines in the pressurized water reactor. Crane's broad experience in flow control for atomic power—dating from the beginning of this radically different field—assures low-cost, dependable service on this critical application.

Whether your future involves atomic energy for power or radioactive materials for processing—call on Crane for the right valves and fittings. You'll find Crane has the depth in research, engineering, and manufacturing abilities and facilities you're looking for.

CRANE VALVES & FITTINGS

PIPE • KITCHENS • PLUMBING • HEATING

Since 1855—Crane Co., General Offices: Chicago 5, Ill. Branches and Wholesalers Serving All Areas

SHOWER-UP

a safe shower

Injury may occur when student jumps from shower because of sudden temperature change.

Hydroguard lets each bather select the temperature he likes best.

If cold water supply fails, Hydroguard shuts off the hot water instantly, automatically.

POW

HYDRO

or possible injury?

Powers HYDROGUARD® Thermostatic Control protects against sudden temperature variation

When shower temperatures fluctuate, as they often do for a number of reasons, students in the shower scramble to avoid the sudden spray of hot or cold water — they may slip, fall or be scalded. This danger can be avoided with Hydroguard,® the *thermostatic* shower valve that provides positive safety plus individual temperature control.

With the turn of *one* dial, each student can have the temperature he enjoys most — warm, cool or anywhere in between. Once set, Hydroguard maintains that temperature regardless of changes in supply pressure or supply temperature. As an added precaution, Hydroguard® has a built in safety limit so that it cannot deliver water hot enough to scald . . . even if the dial is turned all the way to "Hot." It shuts off the hot water instantly, automatically, if the cold water supply fails.

Only a thermostatic control offers you this complete protection.

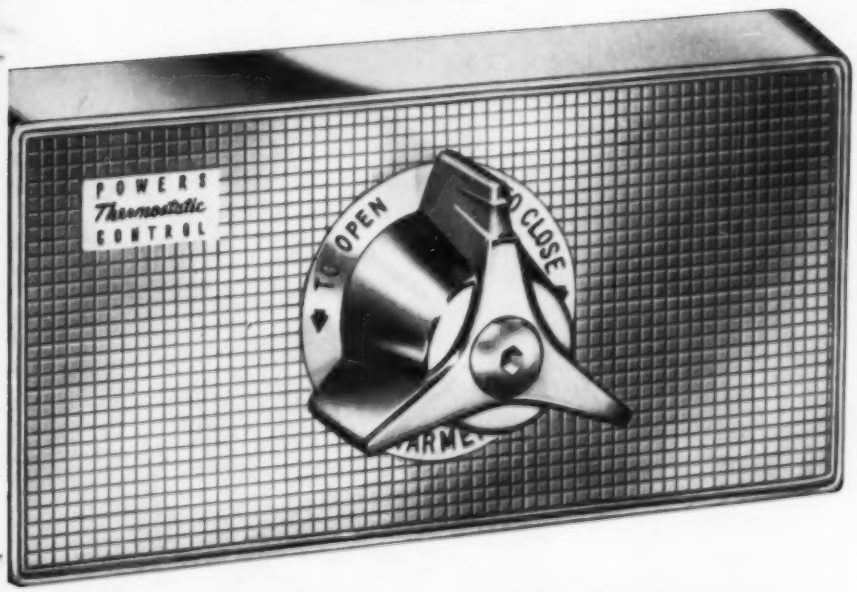
Hydroguard® conserves hot water formerly wasted while adjusting and balancing the hot and cold water valves to the desired temperatures; it simplifies piping and tile work and improves appearance.

Specify Hydroguard® *thermostatic* valves for your new school shower room, dormitory, gymnasium, or swimming pool — then you'll *know* that safety and comfort have been provided.

THE POWERS REGULATOR COMPANY
Skokie 6, Illinois
Specialists in thermostatic control since 1891

Charles W. Nichol & Associates, Chicago — Architect
John K. Fairbairn, Chicago — Mechanical Engineer

Palatine (Ill.), Township High School has Hydroguards® in more than 60 showers.



Additional information is available in our new booklet, "Safer Showers." Write for your copy today.

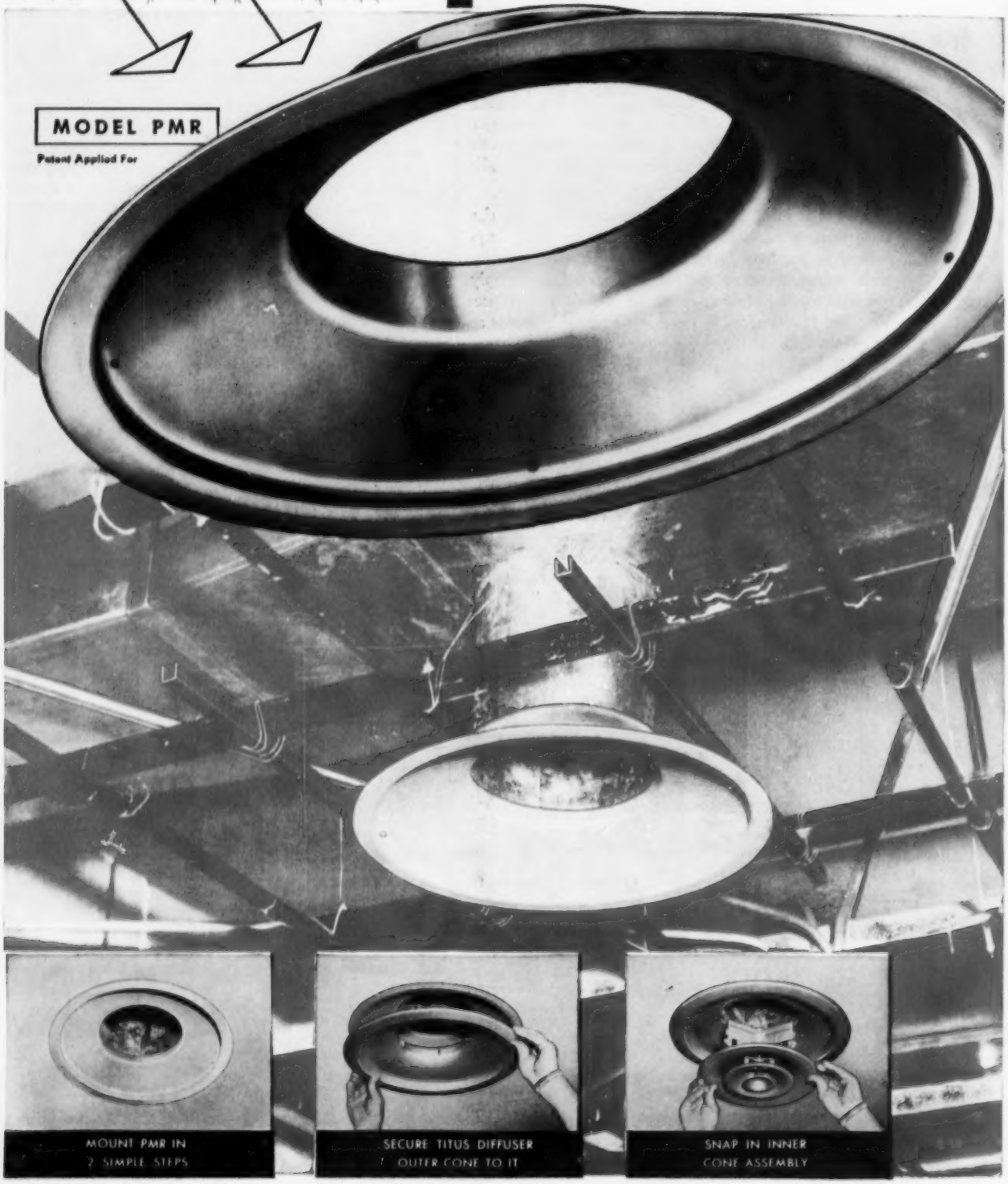
POWERS

GUARD®

New plaster

MODEL PMR

Patent Applied For



mounting ring

- **Saves up to 80% on ceiling diffuser flush mounting costs.**
- **Prevents diffuser from ever sagging away from ceiling.**
- **Especially designed for mounting all Titus' new circular ceiling diffusers.**

Here's a combination mounting ring and plaster ground that eliminates hours of extra time and work—makes flush mounting of ceiling diffusers simple, fast, low cost.

Installs in 2 quick, easy steps: (1) Slip neck of *PMR* over duct (2) Secure *PMR* to lathing channels (or construction used) with 2 screws. And that's it!

After plastering simply mount diffuser to *PMR* with 3 screws. There are no holes to cut in the plaster—no trimming or patching. The Titus Plaster Mounting Ring automatically provides correct size and position of ceiling opening and centers diffuser to it.

Diffusers can never sag away from ceiling because weight of diffuser is supported by sturdy ceiling framework instead of just the duct as in most ordinary installations.

For flush mounting on all types of ceilings. Rigid steel construction. For use with Titus diffusers only.

designed by TITUS

MAIL COUPON TODAY FOR FREE LITERATURE

TITUS MANUFACTURING CORP., WATERLOO, IOWA

Gentlemen: Send me full details, prices on the new Titus Plaster Mounting Rings that cut flush mounting costs up to 80%.

☐ Also send literature on the new Titus Ceiling Diffusers and Accessories.

Name _____

Company _____

Address _____

City _____ State _____

Valley Forge cut production time and reduced costs with Pittsburgh Superfine Fiber Glass Insulation. Two employees are applying insulation to boiler jackets. Superfine reduces weight factor of finished product.

Pittsburgh Superfine Insulation is easily stored, handled and cut.

"PITTSBURGH SUPERFINE has definitely increased our output"

—says Mr. Paul Fusco, Plant Manager

Valley Forge Metals Division of Nicolet Industries, Inc.
Lansdale, Pennsylvania

"It used to take four men two to three days to insulate 400 boiler jackets when we used another type of insulation. Today, using Pittsburgh Superfine Fiber Glass Insulation, four men do the same job in about a day and a half!" reports Mr. Fusco.

When Valley Forge, a fabricator of boiler jackets, baseboard radiation units, and gas, electric and hot water units, switched to Pittsburgh Superfine Insulation, they immediately gained many operating advantages.

With lightweight Superfine, Valley Forge shortened time required to cut insulation for boiler jackets. Insulation application time was reduced 20% since Superfine is held in place with adhesive; this change eliminated a clip-fabricating and spot-welding operation, and reduced spoilage to zero.

"Superfine is flexible, readily follows jacket radii and covers the product more easily," stated Mr. Fusco. "It has a higher insulating value for boiler jackets, too. Its lightweight characteristics make it easy to handle and it reduces the weight of the finished product as much as 20 to 30 pounds, saving on shipping and it helps us keep the plant clean."

LET PITTSBURGH SUPERFINE HELP YOU, TOO!

Pittsburgh Superfine is composed of extremely fine glass fibers and is a lightweight, efficient thermal and acoustical insulating material . . . ideal for controlling heat or cold, absorbing sound or deadening vibration.

If you have insulating problems, Pittsburgh Superfine may be your answer. Why not call us for consultation? *Fiber Glass Division, Pittsburgh Plate Glass Company, One Gateway Center, Pittsburgh 22, Penna.*

PITTSBURGH SUPERFINE IS A PRODUCT OF THE FIBER GLASS DIVISION OF PITTSBURGH PLATE GLASS COMPANY

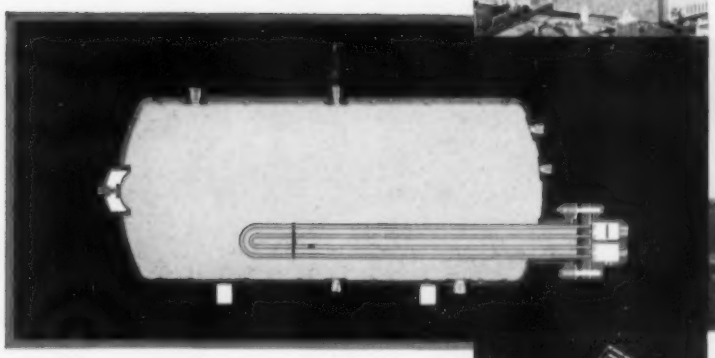
Sales Offices are located in the following cities: Charlotte Chicago Cincinnati, Cleveland Detroit, Houston, Los Angeles, New York, Philadelphia and St. Louis

FIBER GLASS PG

PAINTS · GLASS · CHEMICALS · BRUSHES · PLASTICS

PITTSBURGH PLATE GLASS COMPANY

Dallas: Republic National Bank Building. *Architects:* Harrison & Abramovitz; Gill & Harrell. *General Contractor:* J. W. Bateson Company, Inc. *Consulting Engineers:* Jaros, Baum & Bolles. *Mech. Contractor:* Farwell Company, Inc.



Denver: Mile High Center. *Architects:* I. M. Pei and Associates. *Associated Architect:* G. Meredith Musick. *Contractor:* George A. Fuller Company. *Consulting Engineers:* Jaros, Baum & Bolles. *Mechanical Contractor:* Kerby Saunders, Inc.

New York: Lever House. *Architects:* Skidmore, Owings & Merrill. *Contractor:* George A. Fuller Company. *Consulting Engineers:* Jaros, Baum & Bolles. *Mechanical Contractor:* Kerby Saunders, Inc. *Plumbing Contractor:* Gillman-Rous-Pesce Corp.

FOR TROUBLE-FREE, GUARANTEED PERFORMANCE

THEY SPECIFIED P-K *Copper-Lined* HEATERS

These three famous new buildings are at different points of the compass . . . yet they have one thing in common. When it came time to specify storage heaters, they selected P-K. And though they're far separated in miles, these P-K copper-lined heater installations aren't as isolated as they look. A list of famous buildings all over the country using P-K copper-lined heaters is an honor roll of American business.

Why are P-K copper-lined heaters specified for America's finest buildings? For one thing, experienced engineers know the value of having one supplier who carefully makes and assembles (and is responsible for) every component of the heater.

But more important, engineers know that when it comes to vital points of construction, P-K is miles ahead. For example, P-K copper-lined heaters have rolled joints every 12 inches around the full circumference, to allow for longitudinal expansion . . . heavy flanged copper silicon couplings, welded to both the shell and the lining . . . and a special P-K vacuum breaker to protect the lining from sudden pressure fluctuation. Separate hydrostatic and pneumatic tests are made to guarantee leak-proof linings.

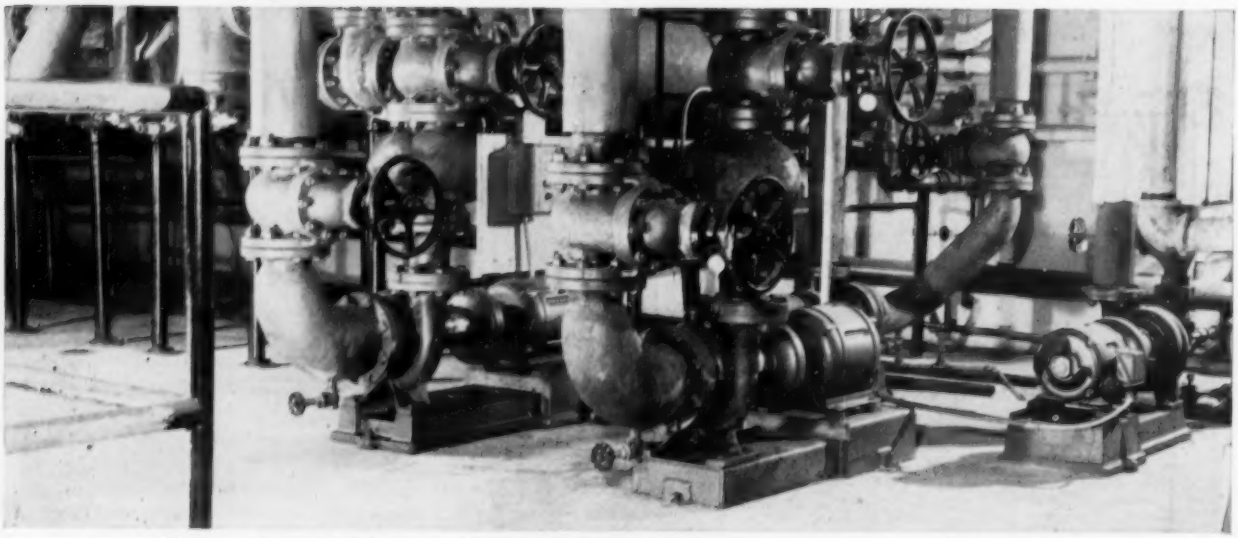
There are other points, too, not found in so-called "economy" heaters, that should be specified for any heater you buy. All these critical construction features have been detailed in a fabricating procedure file which we have prepared on copper-lined heaters. We think you will find it helpful. Write today for P-K file 18A.

The Patterson-Kelley Company, 800 Burson Street, East Stroudsburg, Pa.

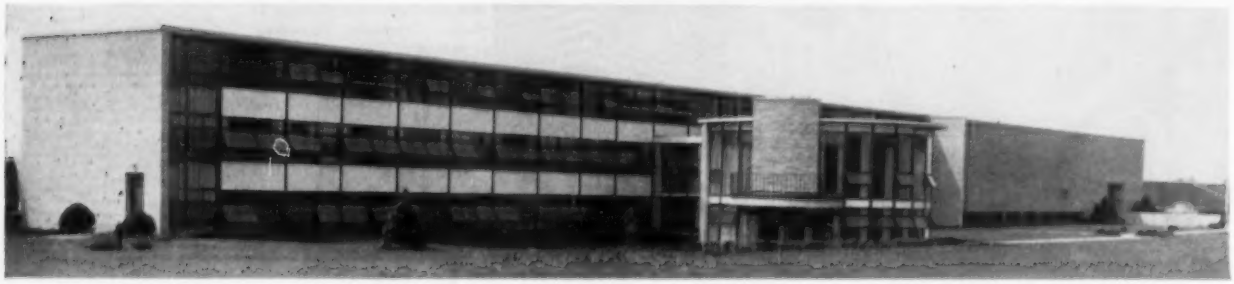
PATTERSON KELLEY

storage water heaters • instantaneous heaters • converters • fuel oil heaters • freon chillers and condensers

B & G UNIVERSAL PUMPS... designed specifically for



Battery of silent B&G Universal Pumps circulating a two-pipe, reverse return hot water heating system.



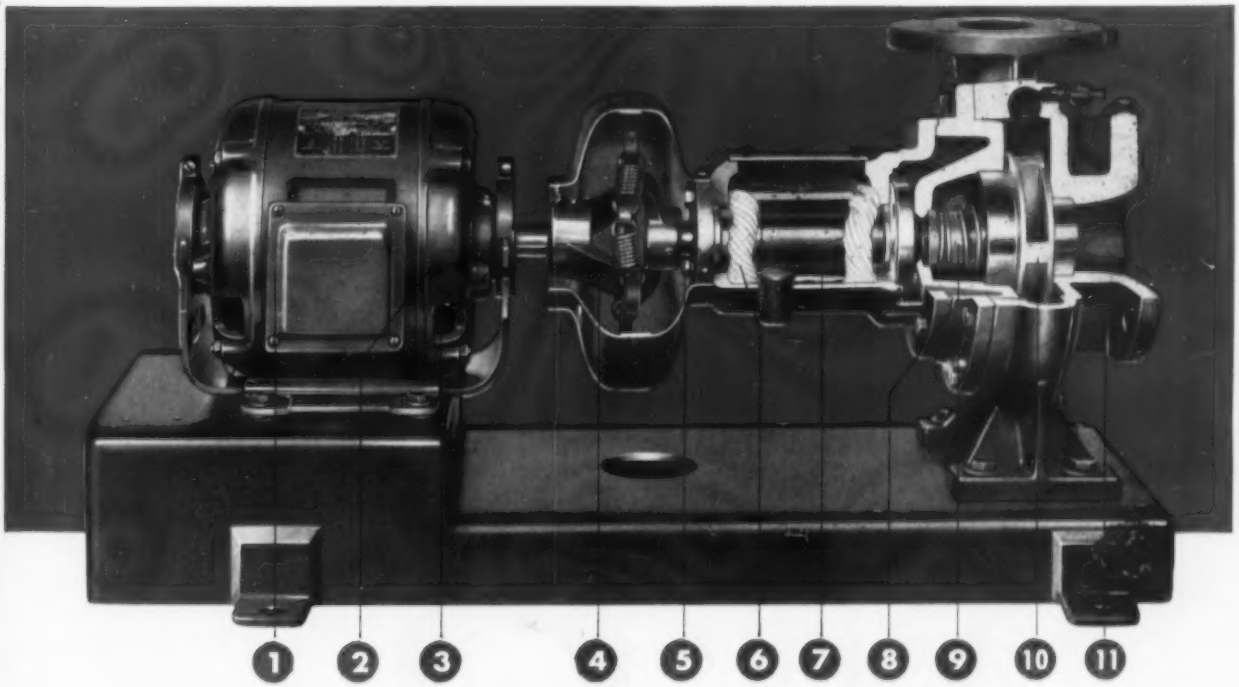
Notre Dame High School, Niles, Ill., is heated with unit ventilators and radiant panels, supplied by B&G Universal Pumps.

The National Home Office of the Allstate Insurance Company, equipped with B&G Universal Pumps.

A B&G Universal Pump is installed here to raise city water pressure.

These multi-story apartment buildings depend on B&G Universal Pumps for quiet operation.

Quiet Operation in liquid Heating and Cooling systems



For forced hot water heating systems where noise control is a factor, a circulating pump must have more than mere ability to meet head and capacity requirements. *Silent and vibrationless operation must be given first consideration!*

Below are eleven reasons why the B&G Universal Pump fully satisfies these operating demands. No vibration eliminators or flexible connections to the piping are needed—no special rubber, spring or resilient bases.

THE MOTOR

1. **Extra quiet...non-overloading.** B&G Universal Motors are specially constructed, selected and stamped for *extra-quiet* operation. They are non-overloading—a Universal Pump will operate satisfactorily along its entire capacity curve.
2. **Sleeve bearings.** Universal Motors are equipped with oil lubricated bronze sleeve bearings for silent performance and long life.
3. **Mounting.** For extra assurance of noiseless operation, Universal Motors, through 5 HP, are NEMA ring-type mounted and completely suspended in rubber. All motors are drip-proof.

THE PUMP

4. **Spring-type coupler.** Another warranty of silent operation. Provides excellent pump and motor protection against the strain of starting torque.
5. **Shaft.** The Universal shaft is *oversized*—affording large bearing surfaces. Made of hardened, special alloy steel, polished to a mirror finish. The integral thrust collar absorbs end-thrust—lengthens seal and motor bearing life.
6. **Lubrication.** Universal pumps use an oil lubricating system. No grease to channel with resulting bearing failure. Oil level indicator permits visual check.
7. **Sleeve bearings.** A "must" for quiet, vibrationless operation and long life of both pump and motor. An exclusive Universal feature!
8. **Removable bearing frame!** To service pump, the entire bearing frame assembly with impeller is easily removed from volute. No pipe connections to break or motor to remove—all the advantages of split case design. Bearing frame assemblies are interchangeable.
9. **Mechanical seal.** This time-proved Seal positively prevents water leakage up to full design pressures. The Seal is self lubricating and features a floating seat of "Remite"—a diamond-hard, highly polished ceramic material developed by B&G.
10. **Hydraulically balanced impeller.** Balancing chamber and thrust pressure relief holes in the impeller reduce thrust to a minimum, lengthening pump life.
11. **Solid type volute.** Support feet directly below volute absorb ever-present piping strains without distorting pump alignment.

BELL & GOSSETT
COMPANY
Dept. EN-5, Morton Grove, Illinois
Canadian Licensee: S. A. Armstrong, Ltd., 1400 O'Connor Drive, W. Toronto

One of a series appearing in **FORTUNE** *and leading architectural magazines.*

top brass

Relax our standards? Never!

Lewin-Mathes' rating in the Copper Tube and Pipe Field is *Specialist—1st Class.* With production and distribution facilities designed specifically for our sole specialty, we can't risk jeopardizing the ready acceptance enjoyed by Lewin-Mathes products.

That's why our plant is completely integrated . . . so we *ourselves* can control quality from raw material to packaged tube. And our 25 Branch Offices and 36 Mill Depots often enable us to provide overnight service when needed.

Consult with the "top brass" handling your next plumbing, heating or air conditioning installation about standardizing on Lewin-Mathes Seamless Copper Tube and Pipe. Our singleness of purpose is your guarantee of *perfection!*

LEWIN MATHES

SAINT LOUIS, MISSOURI

MANUFACTURERS OF
COPPER AND BRASS TUBE, PIPE AND ROD

The New York Coliseum, New York City. Owners: Triborough Bridge & Tunnel Authority. Architects: Leon & Lionel Levy. Mechanical Engineers: Guy B. Panero Engineers. Heating Contractors: Almirall & Co., Inc.

New $35,000,000 Coliseum where the best is a must!

depends on Sarco Heating Specialties

LARGEST AND MOST modern exhibition building in the world—that's New York's new Coliseum!

The 9 acres of exhibition space accommodates four expositions at one time. Each day, on the average, over 25,000 people visit the shows.

With a $35,000,000 investment at stake...with uninterrupted service to exhibitors of vital importance...no chances could be taken with equipment that might cause shut-downs!

Unfailing record of dependability... that's one of the reasons Sarco Specialties, for low-pressure heating and air conditioning systems, are installed in this world's largest exhibition hall... where dependability is "a must."

For undivided responsibility on your installations, it pays to specify and order from one "Complete Line" source ...SARCO-SARCOTHERM.

Write for catalogs to Sarco Company, Inc., Empire State Bldg., New York 1, N. Y.

Sarco Dependability... proved by many repeat orders from America's leaders

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SARCO

AN AFFILIATE OF SARCOTHERM CONTROLS, INC.

Steam Traps... Temperature Controllers... Heating Specialties

Weather-Compensated control systems for steam, hot water and radiant heating

Salt Lake City's First Security Bank building shows how

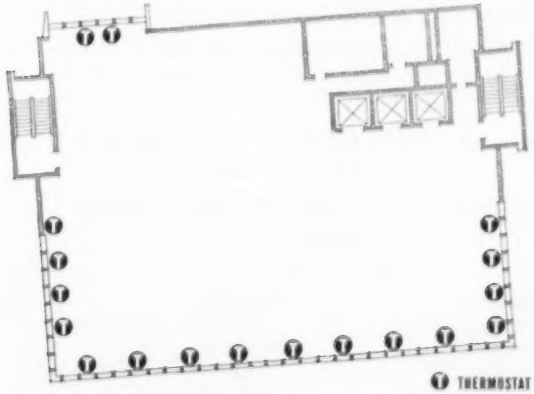
Honeywell can help assure

First Security Bank building, Salt Lake City, Utah. Designed by Bank Building Corporation of America. Associate architect: Slack W. Winburn. Mechanical and electrical engineer: Ferris & Hamig. General contractor: Utah Construction Company. Mechanical contractor: Larsen & Company.

ideal indoor weather for your clients

Exposure is no problem with a Honeywell Customized Temperature control installation. Accuracy and quick response of Honeywell thermostats keep comfort constant despite changing conditions of wind and sun—even in offices like this, where glass is used freely.

Use of space helps determine control needs. Number of people in the bank varies at different times; so does the type of work done. Strategically placed Honeywell thermostats call for exact amounts of heating, cooling or ventilating needed under all conditions.



Thermostats are placed to give individual control to exterior offices that will be partitioned according to tenants needs. Interior office spaces will be controlled by separate zone thermostats.

Honeywell Customized Temperature Control compensates for exposure, weather changes and office layout

IN THE best modern construction, indoor weather is planned with as much care as the building itself.

When this happens—and it happens often—you're likely to find the building has a Honeywell Customized Temperature Control installation.

That's the case in the new quarters of Salt Lake City's First Security Bank. Here, Honeywell provides flexible temperature control to meet the needs of owners and upper-floor office tenants. At the same time the ground-floor banking area is supplied with indoor weather that's ideal for clients, customers and employees. Efficient working conditions are maintained throughout the air-conditioned building.

That's what "customized" means—a control installation fitted to the needs of the building and its occupants, in heating, cooling, ventilating and humidity control.

True customized control can best be provided by Honeywell. Because only Honeywell manufactures all three types of controls—pneumatic, electric and electronic—which permits Honeywell to make truly objective recommendations.

Whether it's an office building, factory, bank or store—any building of any size, new or existing—Honeywell Customized Temperature Control can help solve your client's problems of heating, ventilating, air conditioning and industrial control.

For full details on Honeywell Customized Temperature Control, and the economical Periodic Maintenance Plan, call your local Honeywell office. Or write Honeywell, Dept. HA-10-90, Minneapolis 8, Minn.

MINNEAPOLIS **Honeywell**

Customized Temperature Control

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Your *Best* *Choice!*

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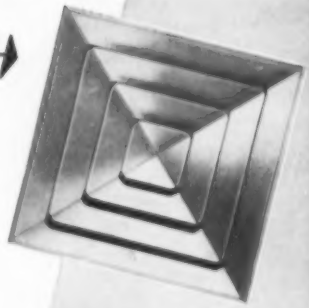
AGITAIR® *Custom Made*

AIR DIFFUSERS with DIFFUSING VANES

. . . better because

A good piece of equipment is no better than the experience behind it.

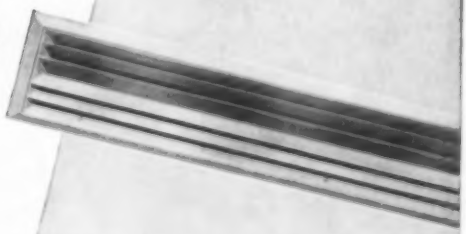


. . . better because

It's the original square and rectangular outlet . . . not just a poor imitation without distinctive features.

. . . better because

The company behind these diffusers has a history for doing things right and guaranteeing results.



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Air Diffusers • Filters • Exhausters

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NON-FLAMMABLE • LIQUEFIED GAS UNDER PRESSURE
CYLINDER HANDLING AND STORAGE: Store out of sun and away from heat.
Keep valve tightly closed. Never drop or refill cylinders.
Return empty container to
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...on Pennsalt's new refrigerants

ISOTRON

THE KEY TO MODERN LIVING

Now—even before the complete line of ISOTRON* fluorinated refrigerants is ready—Pennsalt offers the much-needed "missing link" of individualized *service* and assistance to the air-conditioning and refrigeration design engineer, the wholesaler, and the service contractor.

A pioneer and leader in modern fluorine chemistry, Pennsalt stands squarely behind the new ISOTRON line. ISOTRON products are COMPLETELY INTERCHANGEABLE with other reputable fluorinated refrigerants. They're of precisely the same formulas as the other products of this kind, and will be manufactured in a modern new plant with the rigid quality control you expect of Pennsalt. ISOTRON refrigerants will be packed at the plant in all standard containers.

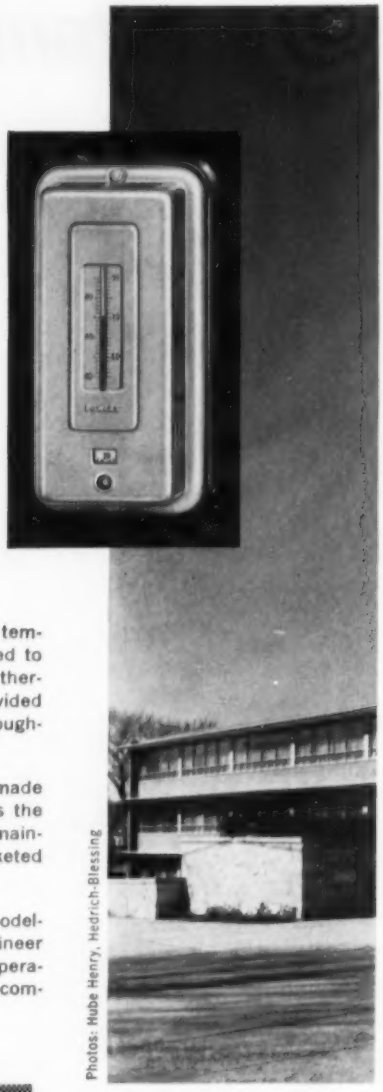
INVESTIGATE THE ISOTRON LINE! Benefit from Pennsalt's advanced thinking and welcome *service*, which will be available nationwide to refrigeration service contractors and wholesalers as well as to original-equipment manufacturers. For further information on ISOTRON refrigerants, write Isotron Chemicals Dept. 362, Industrial Division, Pennsylvania Salt Manufacturing Company, Three Penn Center Plaza, Philadelphia 2, Pa.

*ISOTRON IS A TRADEMARK OF THE PENNSYLVANIA SALT MFG. COMPANY

POWERS Temperature Control

in 1915 and POWERS AGAIN in the

new Highland Park High School



"Because of the many years of dependable control obtained from Powers equipment and the prompt service received whenever required in our old buildings, another Powers temperature control system was installed in our new high school which was planned to meet the needs of 2,000 students"

. . . Mr. E. W. Zaeske, Supt. of Buildings and Grounds.

Functional and architectural features of Highland Park's new high school have been carefully executed to conform to the highest quality of modern school design and to meet the stipulation of keeping future maintenance costs at a minimum.

Since 1891, Powers temperature control systems have been noted for their low operating and low maintenance cost. 25 to 50 years of dependable operation with a minimum of repairs is reported by many satisfied users.

Comfort and Fuel Economy in the 87 classrooms and other spaces here are provided by a Powers control system which regulates the following heating and ventilating equipment:

A Powers MASTROL system regulates the temperature of the forced hot water supplied to convectors under the control of a Powers thermostat for each space. Ventilation is provided by Powers controlled fan units located throughout the buildings.

Natatorium is Unique in that provision is made for the comfort of spectators as well as the swimmers. Convectors in the pool area maintain air at 86° F. while spectators are blanketed with air at 76 to 78° F.

If You Are Planning a New School or remodelling an old one, ask your architect or engineer to include a Powers Quality system of temperature control. You will help insure utmost comfort and lowest upkeep cost.

Photos: Hube Henry, Hedrich-Blessing

THE POWERS REGULATOR COMPANY

SKOKIE, ILLINOIS | *Offices in chief cities in U.S.A., Canada and Mexico*

65 Years of Automatic Temperature and Humidity Control

Symbol of Economy and Quality Control

(c81)

Typical Classroom

Library

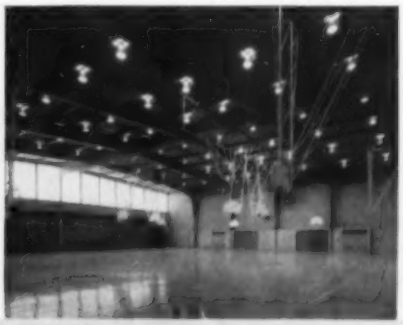
Band Room in Music Dept.

Highland Park, Illinois, High School

Loebl, Schlossman & Bennett, Architects
Samuel R. Lewis, Consulting Engineer
Gust K. Newberg Co., General Contractor
Adelman Heating Corp., Heating Contractor
All of Chicago, Illinois

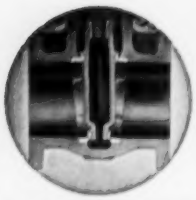
Photos below show one of the 87 classrooms and some of the other spaces controlled by POWERS

Cafeteria and Multi-Purpose Room

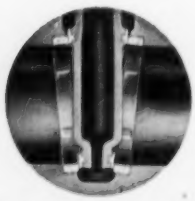


Exhibition Gymnasium

Swimming Pool 50 x 75 ft.



Straight-Flow Port Design reduces fluid turbulence to a practical minimum.



Seat Rings of end-seated type are screwed into the body.

Sure-Grip Malleable Handwheel for non-skid gripping even with heavy gloves.

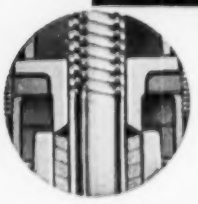
WALWORTH

iron body gate valves

with screwed or flanged ends

... 8 Outstanding Features

For complete information on these new Walworth Iron Body Valves, see your local Walworth distributor, or write for bulletin 106.



Brass Liner on Glands assures greater resistance to corrosion and scoring.

WALWORTH

valves and fittings

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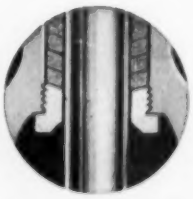
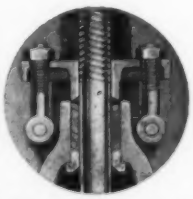
DISTRIBUTORS IN PRINCIPAL CENTERS THROUGHOUT THE WORLD

T-head Disc-to-Stem connection on OS&Y types provides stronger connection, prevents loosening of disc by corrosion.



Bronze Back-Seat Bushings in bonnets of OS&Y valves.

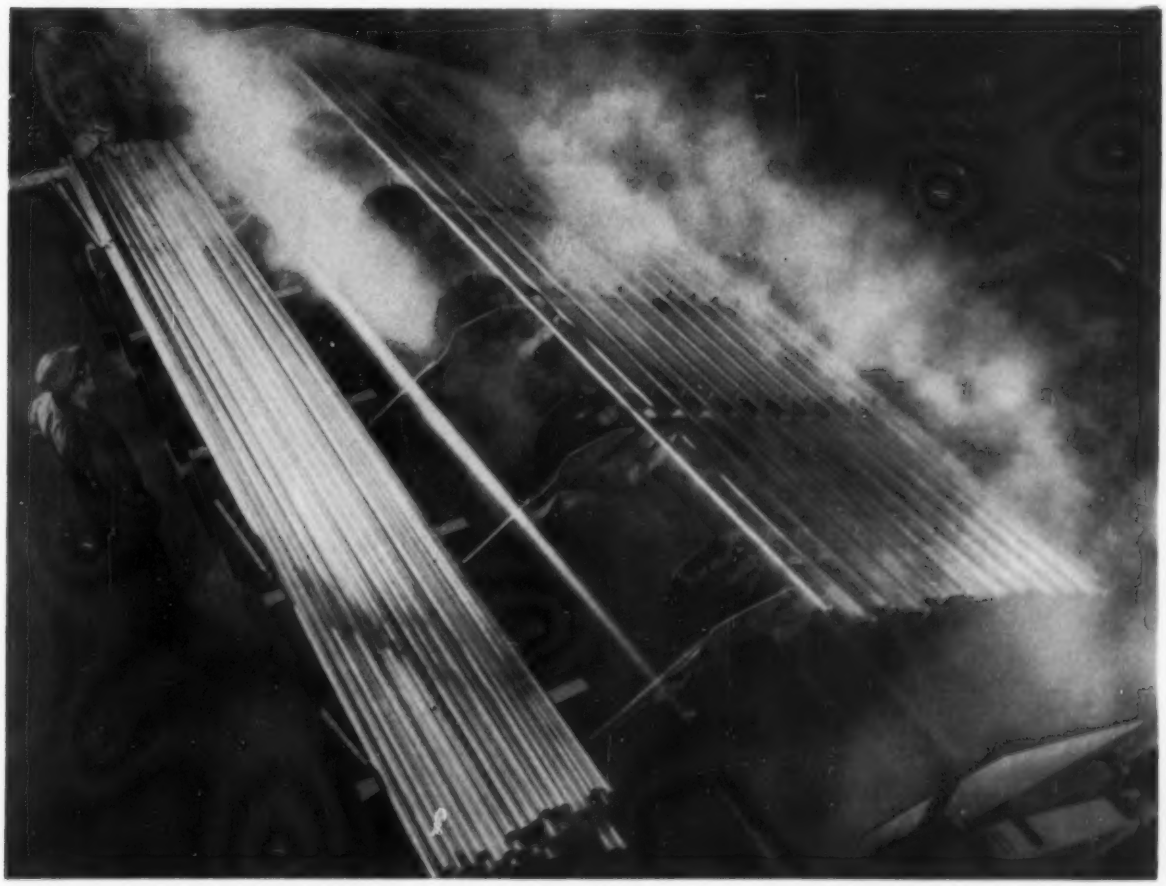
Solid Web Type Disc in OS&Y valves for greater strength and longer service.



Hinged Gland Eye-Bolts on OS&Y valves permit faster, easier repacking under full pressure.

NOW!

SPANG CW GALVANIZED FINISH IS BETTER THAN EVER!



New quenching facilities at Etna produce improved bonding, longer pipe life for your installations

SPANG takes the lead again in product improvement by the addition of new quenching facilities in the manufacture of galvanized CW Steel Pipe. These facilities handle ½" to 4" pipe after it has been galvanized, cooling it in a sodium dichromate solution from 800 F to 160 F under close control.

This careful quenching results in a better bond between the layer of zinc and the steel surface of the pipe, and increases the ductability of the zinc coating.

Here's what it does for you

First, the stronger bond gives you added assurance that the galvanized finish on SPANG CW Pipe will not crack, flake, chip or peel, even under the severest bending strains.

Second, the chemical reaction of the sodium dichromate on the finish retards the formation of white rust on the pipe, an important factor in adding extra service life, especially when ocean shipments are involved. In addition, the galvanized, lustrous finish stays brighter longer.

Add to this all the other *quality-control* features that go into the manufacture of SPANG CW, and you have a *top-quality* product for *top-quality* installations . . . a steel pipe that's clean, uniform, strong, easy to work with.

Take advantage of SPANG's *quality control*. Order SPANG CW Pipe from your nearby SPANG Distributor. He carries the complete line.

SPANG-CHALFANT

DIVISION OF THE NATIONAL SUPPLY COMPANY

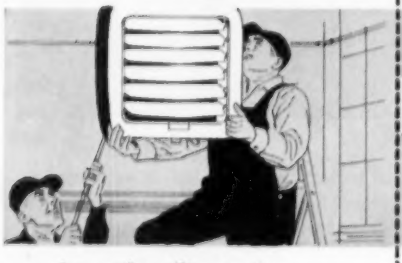
General Sales Office: Two Gateway Center, Pittsburgh, Pa. District Sales Offices: Atlanta, Boston, Detroit, Houston, Los Angeles, New York, Philadelphia, Pittsburgh, St. Louis

When you choose a unit heater with this nameplate . . .

Modine horizontal discharge unit heater for steam or hot water.

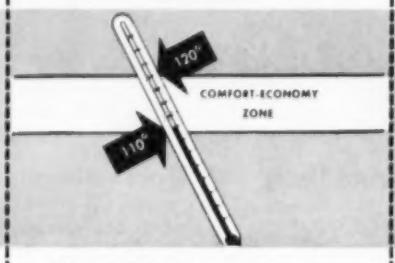
Modine vertical discharge unit heater for steam and hot water.

you make these savings *automatically*



Lower handling and installation costs . . .

Modines save you money right from the start. Greatly reduced weight and bulk make handling and installing easier. And there's a Modine Unit for every need.



More comfort for your fuel dollar . . .

Discharge air temperatures are correctly related to volume and velocity . . . to insure desired heat throw and perfect comfort . . . optimum fuel economy per heating dollar.

Reduced maintenance costs, longer service . . .

Design utilizes the latest advances in metallurgy and quality construction. Modines outlast ordinary units . . . require a minimum of maintenance and service.

Modine
UNIT HEATERS

See the Modine representative listed in the classified section of your telephone directory. Or write for free Bulletin 155, Modine Mfg. Co., 1509 DeKoven Ave., Racine, Wisconsin.

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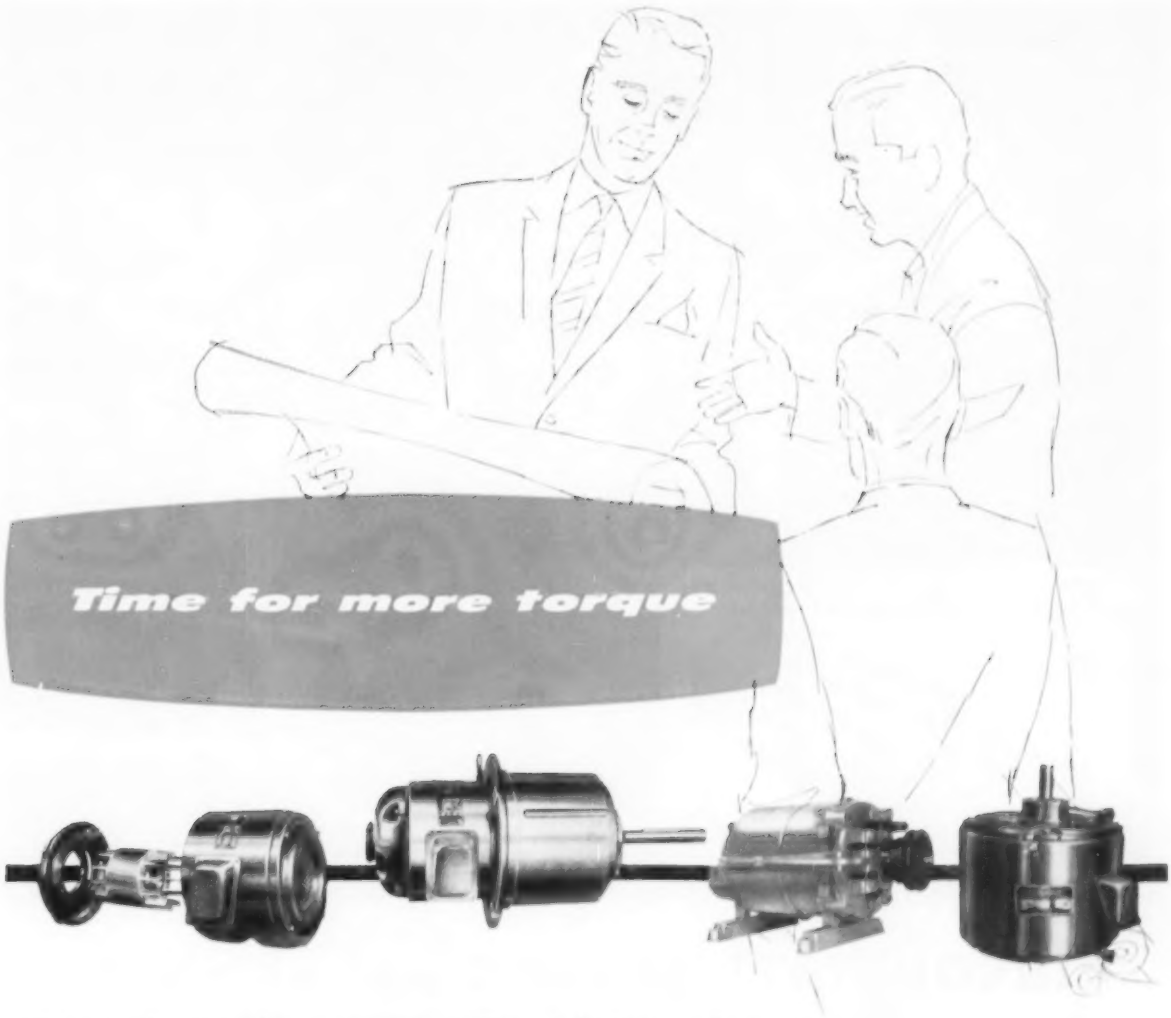

When you plan to purchase new motors, you'll want the best—at the most reasonable cost. You will demand built-for-the-job efficiency, and no compromises with quality. You will expect co-operation at each stage of design and development—and on through to manufacture and delivery on the date specified. And after installation, you'll want long-life and the minimum of down-time for servicing. At all times, you will appreciate being a special customer of the motor manufacturer—whether you buy one, or one hundred motors.

All this you can expect from Diehl. The best built-for-the-job motor at the most reasonable cost. You will get the benefit of 69 years of Diehl know-how applied to your particular requirements. For Diehl design, sales and installation engineers comprise one of the finest teams of electric motor experts in America today.

The emphasis at Diehl is on close liaison with all customers at every stage of production. Give your power problems to a Diehl motor specialist. Get the right answers and the best motors—fast. You invest in performance when you design with Diehl.

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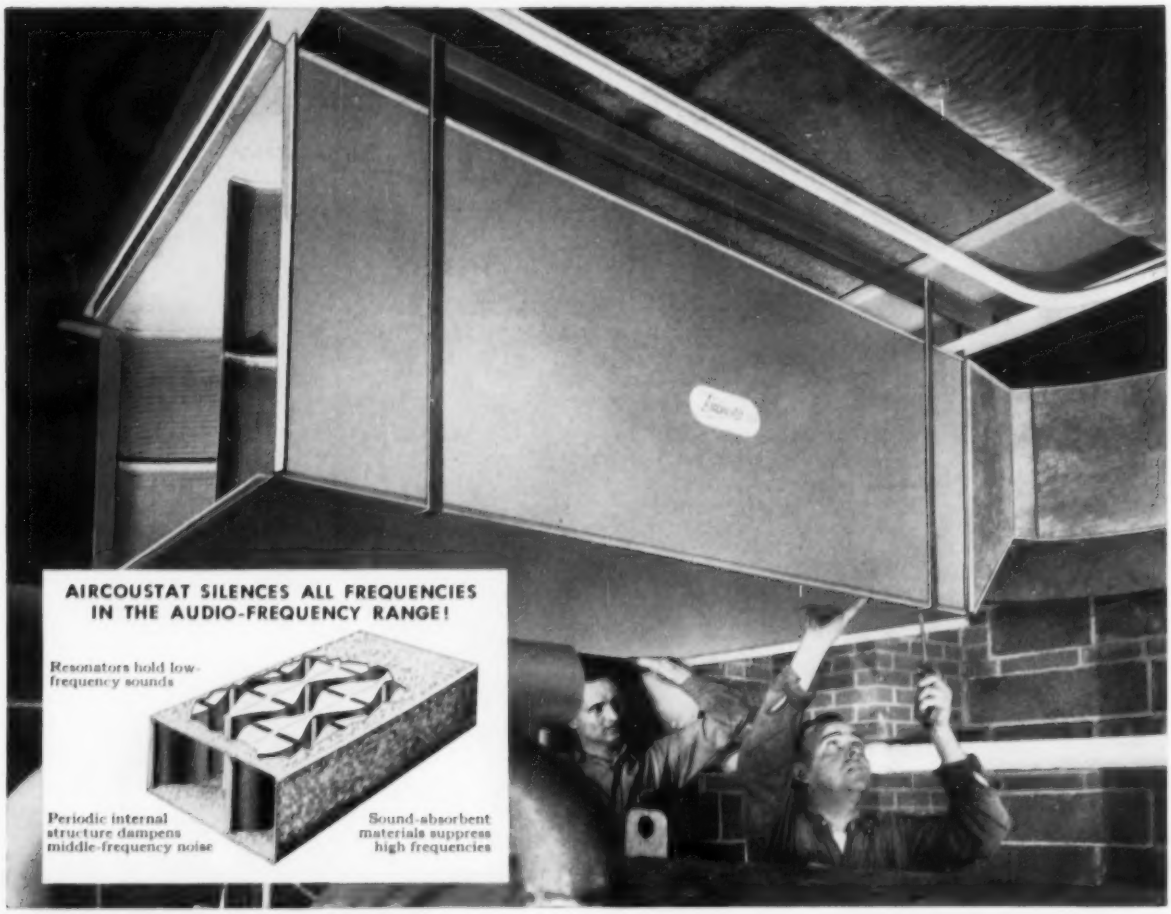
INTEGRAL AND FRACTIONAL HORSEPOWER MOTORS ARE AVAILABLE IN A WIDE RANGE OF TYPES AND SIZES


AIRCOUSTAT SILENCES ALL FREQUENCIES IN THE AUDIO-FREQUENCY RANGE!
Resonators hold low-frequency sounds
Periodic internal structure dampens middle-frequency noise
Sound-absorbent materials suppress high frequencies

AIRCOUSTAT* Sound Traps eliminate air conditioning noise at 50% less cost

Acoustical Performance Guaranteed. Easy to Install. Pre-Engineered — No Design or Layout Headaches.

Revolutionary AIRCOUSTAT Sound Traps require no special tools for installation . . . reduce your labor costs and lower your installation time. Units fit any size or shape of duct. If AIRCOUSTAT fits *geometrically*, it fits *acoustically*.

AIRCOUSTAT is the most efficient method of sound-deadening you can provide your customers. A 7-foot AIRCOUSTAT unit suppresses as much sound as 100 feet of ordinary duct lining. AIRCOUSTAT eliminates all frequencies in the entire audio-frequency range, silences entire systems or selected outlets. Flow resistance and pressure drop are lower. 4 series cover applications ranging from general offices to recording studios.

Discover how AIRCOUSTAT Sound Traps can save you time and money . . . create greater customer satisfaction.

** Koppers Trade Mark*

KOPPERS **INDUSTRIAL SOUND CONTROL**

Engineered* Products Sold with *Service

MAIL THIS COUPON TODAY

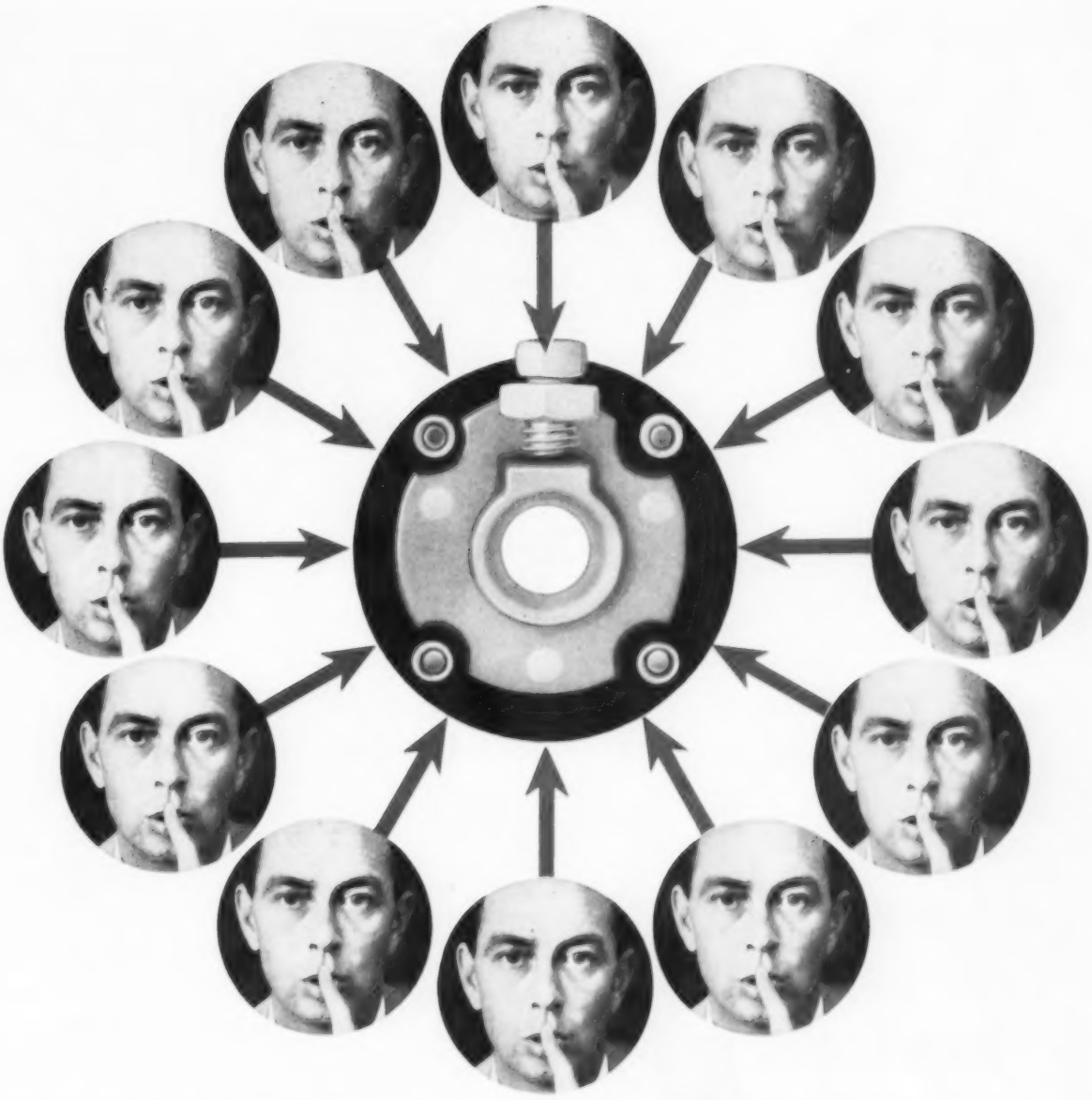
KOPPERS COMPANY, INC., Metal Products Div., Industrial Sound Control Dept., 6210 Scott St., Baltimore 3, Md.
Gentlemen: Please send me a free copy of your booklet on AIRCOUSTAT Sound Traps.

Name..... Title.....

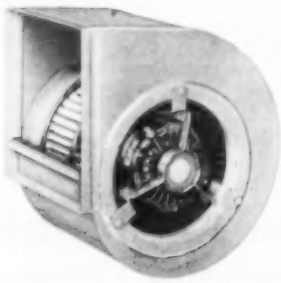
Company.....

Address.....

City..... Zone..... State.....



SILENCE IS THE HUB* OF THE MATTER



***NEOPRENE** Here at Utility we take a meager view of noise . . . believe it has no place at all in our Direct Drive Blowers. But licking the problem of noise was a challenge, and a tough one. The key point of noise is the blower hub. What material could be used to give it all the qualities of lifetime service, yet provide quiet operation under all conditions?

We found Neoprene to be the ideal material to shush noise. How to build that Neoprene Hub was and is the "secret of silence" of all Utility Direct Drive Blowers. This silence factor has boosted sales for manufacturers of heating, cooling, refrigerating and ventilating equipment the country over. Just another example of go-ahead planning, years-ahead engineering that makes Utility the firm to consult when considering only the best in blowers and parts to fill your manufacturing needs.

YOU CAN'T MATCH UTILITY FOR PRODUCT AND PRICE! Manufacturers of heavy and standard duty blowers for heating, air conditioning and ventilating installations. Producers of blowers and blower parts for original equipment manufacturers. Write for catalogue data.

A Division of Utility Appliance Corp.

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UTILITY

Export Division
141 So. El Camino Drive
Beverly Hills, Calif.
Cable: UTILIFAN, Los Angeles

You cut costs... speed assembly with new U-BRAND Reducing Nipples

Fewer joints mean faster assembly of gas or water lines when you use U-BRAND reducing nipples. Since a reducing nipple costs less than a reducer or bushing and regular nipple, you save on fittings, too.

Swedged from new, mill-tested steel pipe, U-BRAND reducing nipples are a single leak-proof unit. True threads and clean outside chamfer speed installation. Available in black or galvanized finish, there are four convenient sizes ¾″ x ½″, 1″ x ¾″, 1¼″ x 1″ and 1½″ x 1¼″.

If you're interested in saving time and cutting costs, try U-BRAND reducing nipples on your next job. Order a supply from your jobber today.

Also available... U-BRAND Std. Brass Nipples

¼″ to 2″ diameters in lengths from close to 6″

A single source for all your pipe fittings needs

Galvanized and Black U-Cote Malleable Iron Pipe Fittings—Unions—Plugs and Bushings—Cast Brass Solder Joint Pressure and Drainage Fittings—Cast Iron Drainage and Screwed Fittings—Steel Nipples and Couplings—Insert Fittings for Plastic Pipe.

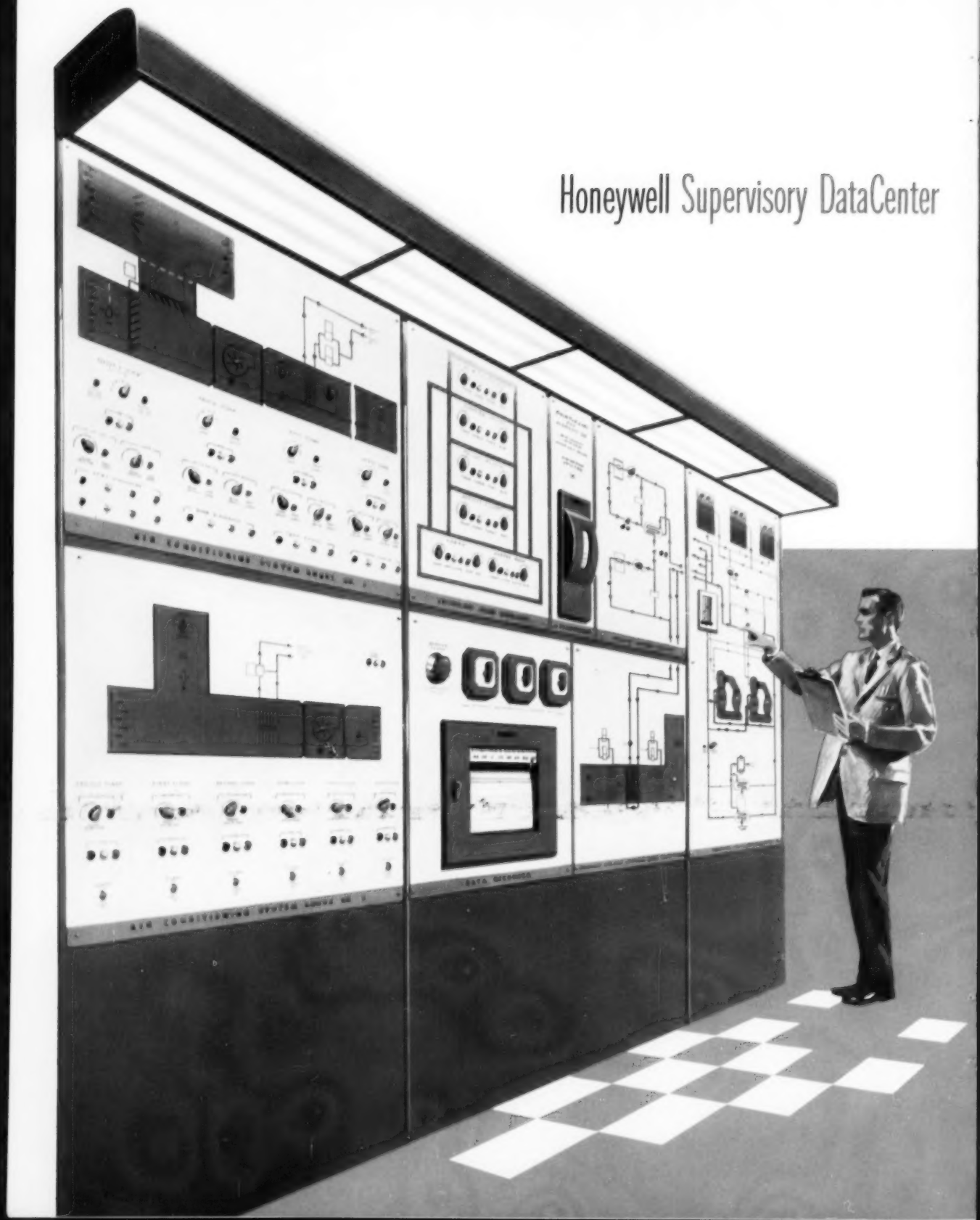
U BRAND

The Union Malleable Manufacturing Company
Ashland, Ohio

Honeywell Supervisory DataCenter now brings

ADVANCED AUTOMATION TO AIR CONDITIONING!

...a bold new concept for economical year-round climate control



Honeywell Supervisory DataCenter

Now one man can operate a building's entire air conditioning system from a single panel

Advanced automation in air conditioning, made possible by the Honeywell Supervisory DataCenter, has resulted in many remarkable achievements in practically every phase of indoor climate control.

New techniques of automation, instrumentation and electronics make air conditioning as automatic as possible and provide for efficient supervision.

Operating efficiencies have been realized that were never believed possible. To the public it has brought a new standard of comfort. And to the engineer and architect it offers the opportunity to dramatize the use of air conditioning and provide flexibility of design that will avoid obsolescence for years to come.

And remember, every component in a Honeywell Supervisory DataCenter is made by Honeywell, backed by Honeywell's dependable service.

saves steps for operating personnel, thousands of dollars for building owners

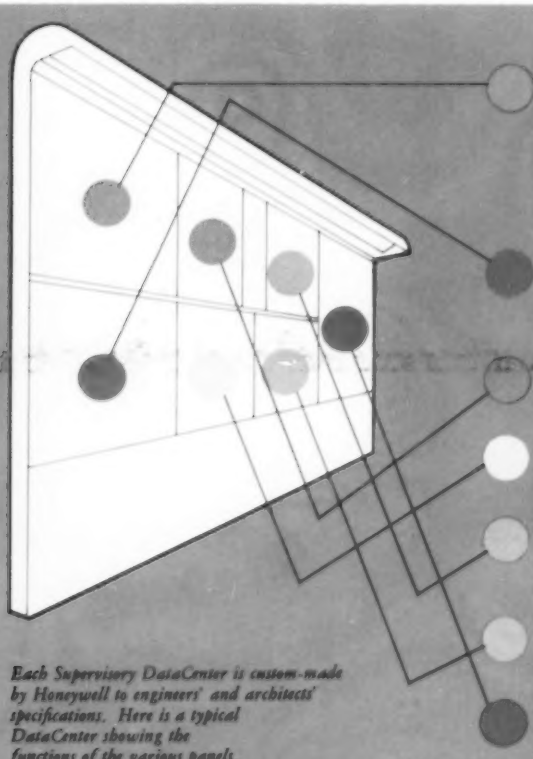
Focuses all eyes on air conditioning. Publicly displayed, a colorful Honeywell Supervisory DataCenter does a lot to highlight a building's "hidden" deluxe comfort features.

DataCenter does the "leg work." Readings from any remote point in the building come to one central control panel—eliminating the need for manual floor-by-floor checking.

Central control of every floor. Temperature in open areas on every floor, plus functions in the complete system are always under fingertip control at one central point.

Savings liquidate equipment cost. A DataCenter combines a number of operating maintenance jobs into *one*—also detects operating irregularities to aid trouble shooting.

Better individual room thermostat control. A DataCenter improves space thermostat performance by permitting closer supervision of the primary heating and cooling supply.



Each Supervisory DataCenter is custom-made by Honeywell to engineers' and architects' specifications. Here is a typical DataCenter showing the functions of the various panels.

Central Supply Units. Provides remote adjustment of mixed air and coil deck temperatures, plus coil air temperature readings. Final space temperature is determined by local pneumatic thermostats that regulate the percentage of air passing through the coil deck and the bypass for each zone. (These temperature readings—as well as those concerned with other panel functions in the complete system—are shown by the indicator located on the vertical top center panel.)

Annex Units. These units control space temperatures in the annex. Temperature corrections are made by means of the control point adjustment knobs located on the building outline.

Interior Space Temperatures. Building outline provides graphic floor-by-floor picture of the interior space thermostats. Push-button control and adjustment may be made from the panel.

6-Point Temperature Recorder. To permit careful analysis of operations, this instrument gives a simultaneous record of any 6 temperature pickups in the entire system.

Basic Heating and Cooling Circuit. Start-stop buttons control circulating pumps; pilot lights indicate which equipment is operating. Panel also provides several push-button temperature readings with adjustment of controlling thermostats.

Primary Air System. This section provides push-button temperature readings, and adjustment of thermostats controlling reheat and dehumidifier coils.

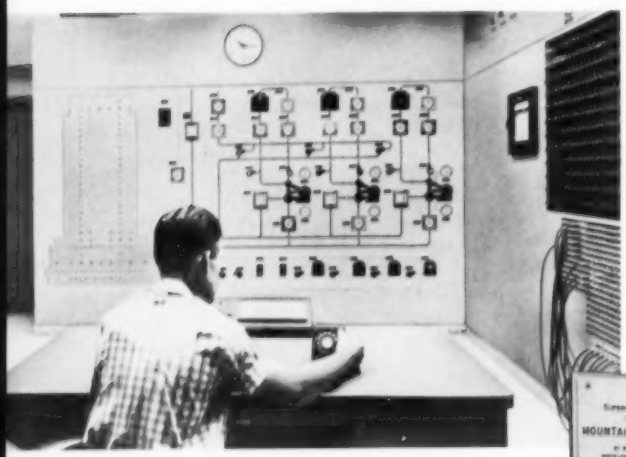
Basic Refrigeration Plant Supervision. Shown here is color diagram of the system with miniature controller for remote indication and adjustment of chilled water temperature. Accessory equipment can be started and stopped at the panel—pilot lights indicate when they're running. Push buttons provide temperature readings at all key points in this system.

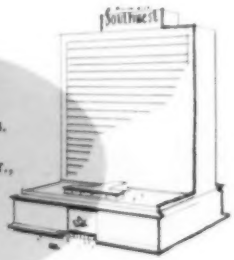
In every sized building, architects and engineers acclaim "the new visibility"

Air conditioning represents up to 25% of a modern building's cost. Until now this valuable asset has been a hidden maze of ducts, pipes and equipment. Tenants and customers had no real awareness of the necessary investment and continuous supervision required to give them comfort.

This is another reason why Honeywell Supervisory DataCenters are being hailed with such enthusiasm. It offers recognition where it is due. The display factor gives the owner a decided rental advantage, and at the same time offers highest compliments to the engineer's and architect's professional skill.

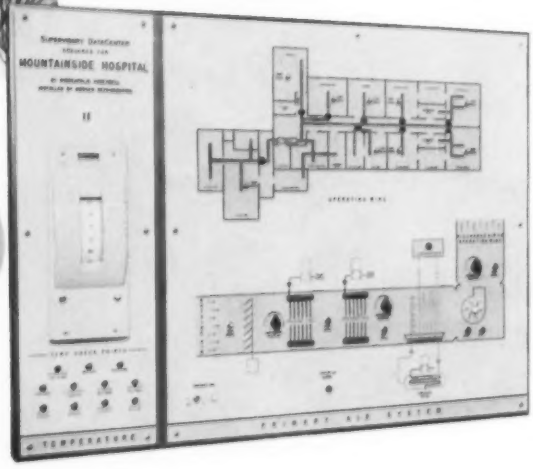
Here are three typical Supervisory DataCenters—ranging from large to small.

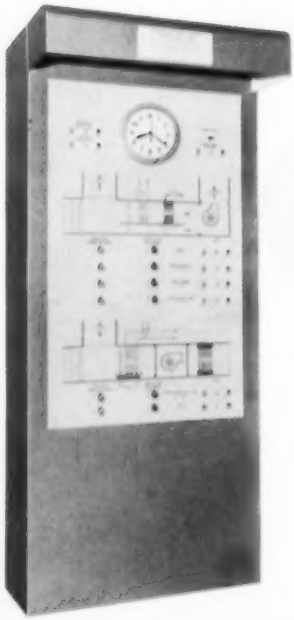




Bank of the Southwest Building, Houston, Texas. Kenneth Franzheim, Architects; H. E. Bovay, Jr., and Reg. F. Taylor, Engineers; Straus-Frank Company, Contractor.

Mountainside Hospital, Montclair, New Jersey. Monsen, Contractor and Engineer





Shreveport Club, Shreveport, La. Neild-Somdal-Associates, Architects; Carl M. Hadra Associates, Engineers; Mechanical Contractors, Inc., Air Conditioning.

If you would like more information about Honeywell Supervisory DataCenters, call your local Honeywell office, or write Minneapolis-Honeywell, Dept. SDC-1, Minneapolis 8, Minnesota.

SUPERVISORY DataCenter

a product of MINNEAPOLIS **Honeywell** First in Controls

Klipfel

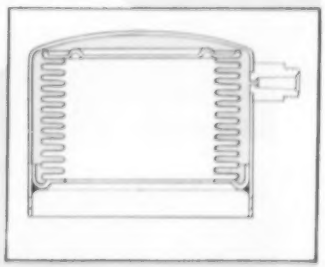
GOLDEN GENIE
TEMPERATURE REGULATOR

- Self-actuated
- Vapor Pressure Type
- Emergency manual control override
- Accurate temperature adjustment

...precision control at your command!

Modern design and skilled craftsmanship are combined in the new Klipfel Golden Genie to assure accurate, positive, low cost temperature control. Featuring strong, long lasting 2-ply bellows, it operates at higher working pressure with smaller bulb, develops more power for valve actuation.

For full details on the Golden Genie and the complete line of Klipfel Valves, write to Dept. C-10.



Rugged 2-ply Double Wall Bellows . . . Vapor pressure cup construction gives added strength. Cannot be over-extended. High pressure small bulb operation develops more power.

Klipfel **VALVES, INC.**

Division of Hamilton-Thomas Corp.
Hamilton, Ohio

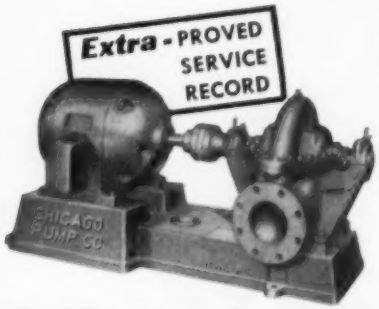
Export Dept.—1010 Schaff Bldg.
Philadelphia, Pa.

these "Extras" in CHICAGO PUMPS mean

Longer, Better Performance Lower Cost Operation and Installation

FLUSH-KLEEN Sewage Ejector TYPE "S"

The Flush-Kleen Sewage Ejector can't clog because only liquid is handled by the impeller. Coarse matter is strained out, then backwashed from the strainer into discharge pipes. No strainer baskets to clean, no repairs due to clogging, no foul basins because solids never reach the wet basin. Besides being easier to maintain, Flush-Kleens last longer and require less power. Write for details in Bulletin 122C.



DOUBLE SUCTION HORIZONTALLY SPLIT CASE PUMP

Accurately machined and fitted revolving parts in carefully cast casing. Have proved reliable for house pump, circulating and booster service. See Bulletin 101.

TYPE AVC CONDENSATION PUMP AND RECEIVER

Low inlet — no elaborate foundation needed for installation — for systems to 10,000 EDR and 10-30 psi. See Bulletin 245.

A COMPLETE LINE FOR EVERY BUILDING SERVICE

NEW F-C AND C-C PUMPS EITHER FLEXIBLE-COUPLED OR CLOSE-COUPLED

Compact, smooth running, quiet, — ceramic faced seal is highly resistant to wear — for circulating and booster service. Heads from 10 to 190 feet, capacities from 5 to 400 gpm. Bulletins 107 and 108.

SURE-RETURN CONDENSATION PUMP AND RECEIVER

Low inlet — positive head on suction — no friction in manifold between pump and receiver — handles extremely hot condensate without steam binding — for systems to 75,000 EDR and low or medium pressures. See Bulletin 250.

Write to Department B

For additional information on any of the above pumps, specify by bulletin number.

fmc

CHICAGO PUMP COMPANY

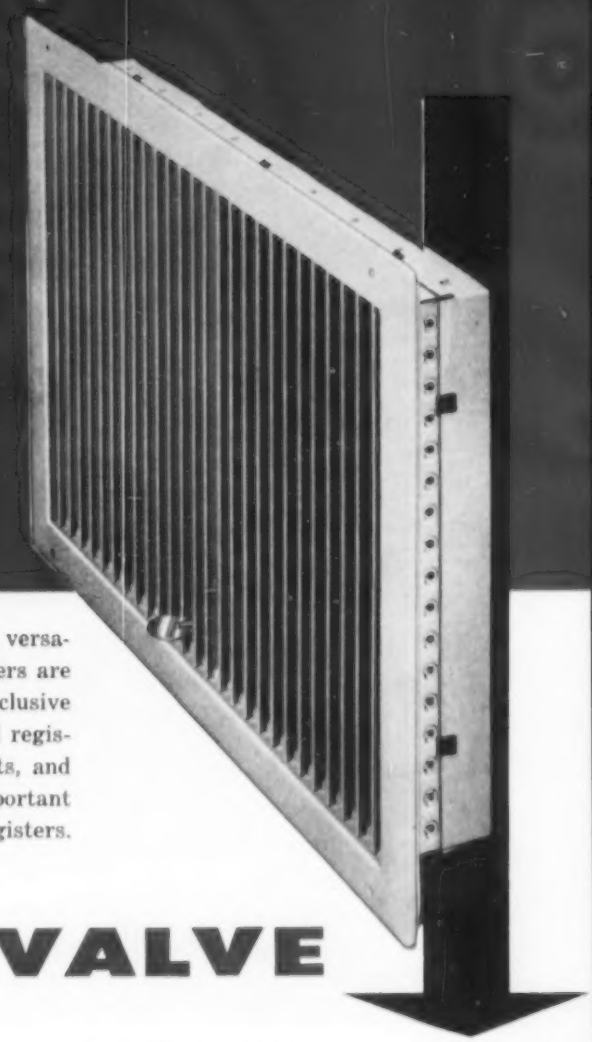
Subsidiary of Food Machinery and Chemical Corporation

BUILDING PUMP DIVISION

622 DIVERSEY PARKWAY • CHICAGO 14, ILLINOIS

Condo-Vac ®, Sure Return ®, AVC, LVC, Fire, House & Circulating Pumps, Pneumatic & Tankless Water Systems . . . Flush Kleen ® Sewage Ejectors, Little Giant ® & Non-Clog Bilge Pumps. Pumps for every industrial use.

MULTI-TROL
COMMERCIAL REGISTERS
by Air Control
GIVE YOU THIS BIG DIFFERENCE*

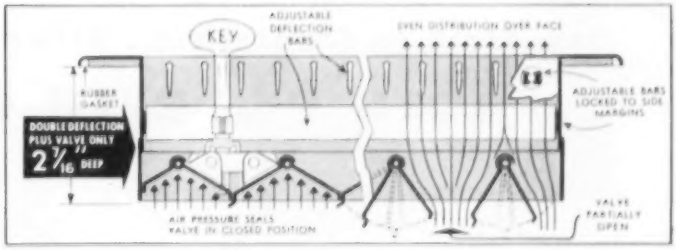


With Multi-Trol commercial registers you get performance and versatility no others can equal. Where ordinary commercial registers are too deep to be used with standard ducts, Air Control's exclusive Shallo-Valve solves the problem. Multi-Trol 4-way deflectional registers with Shallo-Valve can be installed in standard 3¼" ducts, and still leave ample space for adequate air flow. That's the important difference between Multi-Trol and any other commercial registers.

New* SHALLO-VALVE

EXCLUSIVE WITH MULTI-TROL COMMERCIAL REGISTERS

Multi-Trol Shallo-Valve louvers are the opposed-action type, designed to deliver air evenly over the face of the register at any velocity. When closed, air pressure seals the valve tightly, preventing annoying whistles. Adjustable bars and opposed-action valves provide positive 4-way control of the air stream. The Shallo-Valve of Multi-Trol registers, only 2½" deep, requires no special duct work in commercial or residential heating-cooling installations.


KEY
ADJUSTABLE DEFLECTION BARS
EVEN DISTRIBUTION OVER FACE
RUBBER GASKET
DOUBLE DEFLECTION PLUS VALVE ONLY 2 3/16" DEEP
ADJUSTABLE BARS LOCKED TO SIDE MARGINS
AIR PRESSURE SEALS VALVE IN CLOSED POSITION
VALVE PARTIALLY OPEN

Only Multi-Trol commercial registers by Air Control offer you all these advantages:

Key-operated Shallo-Valve — Minimum Air Resistance — Air Foil Contour Face Bars — Modern Styling with smooth, rounded corners — Handsome beige finish. Pivots of adjustable face bars are locked into margin, can't pull out.

Multi-Trol registers and grilles come in a wide range of sizes and styles for every need. See your favorite jobber.

WRITE FOR CATALOG 56-AC SHOWING THE COMPLETE MULTI-TROL* LINE

*Patent Pending

AIR CONTROL PRODUCTS, INC., Pace St., Coopersville, Mich.

Lord & Taylor branch store, West Hartford, Conn., has network of Beth-Co-Weld steel pipe for chilled water system. *Contractor:* The Horton Co., Hartford. *Jobber:* Callahan Company, Hartford.

New Store in Connecticut...Office Building in North Carolina

BOTH USE BETH-CO-WELD PIPE

Whether it's for a store, or office building, or some other type of structure, you can count on good service when you use Beth-Co-Weld steel pipe for heating and plumbing lines, and for sprinkler systems.

Beth-Co-Weld is ideal general-purpose pipe because it is so easy to work and install. Besides, it is made from a good grade of steel by the continuous-weld process, ensuring a tight, sound weld.

Most jobbers carry Beth-Co-Weld in these sizes:

DIAMETER	WEIGHT	LENGTH
½ to 4 in. ½ to 3 in.	Standard Extra Strong	21 ft, plus or minus 1 in.; also random lengths

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

Owned by Home Finance Group, Inc., this structure in Charlotte, N. C., has Beth-Co-Weld steel pipe throughout. *Contractor:* Embree-Reed, Inc., Charlotte. *Jobber:* Noland Co., Spartanburg Branch.

BETHLEHEM STEEL

BETHLEHEM STEEL

29° below zero outside

...National-U. S. CONTROLLED COMFORT inside

National-U. S. Commercial Steel Boiler... supplies five-zone heating system and plentiful quantity of domestic hot water

In the winter, the thermometer records temperatures as low as 29° below zero at Proctor, Vermont. But—inside the new Proctor High School it's comfortable because the Board of Education met the problem of supplying a five-zone heating system with a National-U.S. Commercial Steel Boiler.

Furthermore, comfort includes a plentiful supply of domestic hot water throughout the school . . . for showers; washrooms; sinks; and the home economics room.

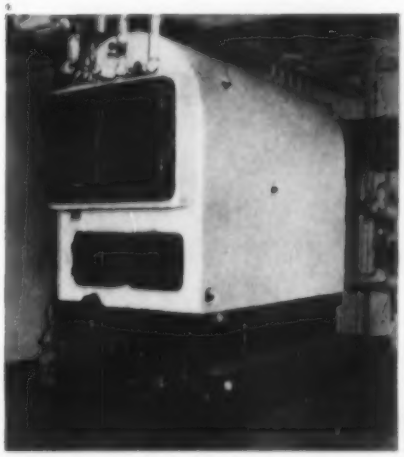
Quick "pick-up" and lower final costs are also features of this installation. In 30 minutes (on the coldest days) the school temperature climbs to a normal of 72° after being cut to 62° for the night. Fuel bills run considerably less than for the old high school.

And, this is but *one* example of the efficiency and economy you obtain with National-U.S. Commercial Steel Boilers. They are *the* specification of the day for features that add comfort and practical control of temperatures for schools, colleges, institutions, commercial and industrial buildings.

Send for Catalog No. 700.

Comfortable Modern High School

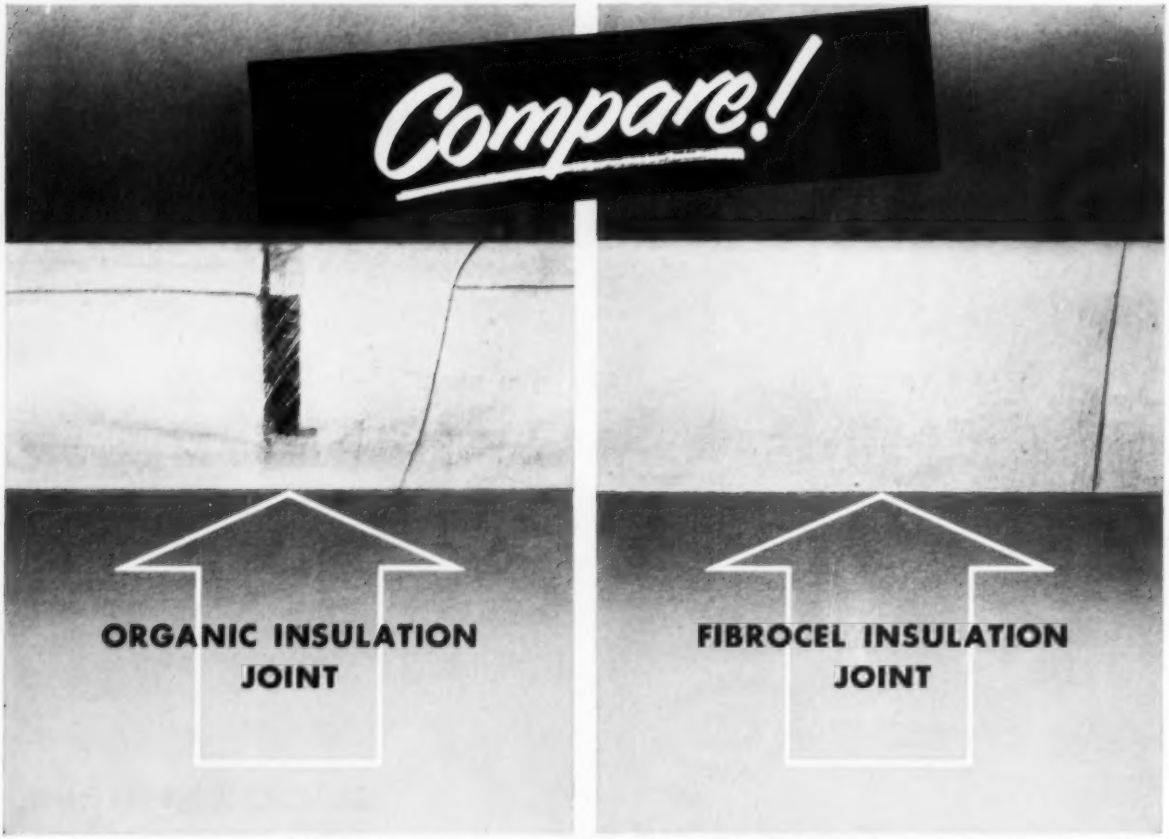
at Proctor, Vermont. Interior volume 1,477,080 cubic feet . . . 19 rooms. Classrooms heated by convectors. National-U.S. Commercial Steel Boiler, oil fired, installed in school by Adams and Hoe, Plumbing Contractor of Rutland, Vermont. School designed by I. W. Hersey Associates of Durham, N. H.



National-U.S. Radiator

CORPORATION

HEATING AND AIR CONDITIONING DIVISION
Johnstown, Pa.



Joints are shown after exposure to high humidity and hot-pipe drying action under identical test conditions.

Shrinkage test proves joints *stay tight* with J-M FIBROCEL® Insulation

ONLY FIBROCEL OFFERS ALL THESE ADVANTAGES

No shrinkage—eliminates gaping joints. **Resists compression**—retains full-wall thickness. **Uniform dimensions**—precision formed for exact fit. **Economical application**—lightweight, easy to cut with a knife. **Thermally effective. Permanent**—flame, rot, odor and vermin proof. Developed by Johns-Manville Insulation Research.

A new molded silica insulation developed for plumbing, heating, chilled water and dual service applications in the 35F to 300F temperature range

Fibrocel completely eliminates objectionable shrinkage caused by atmospheric changes!

Tests prove it won't shrink even after moisture exposure and prolonged service under continuous steam flow. This means Fibrocel joints stay tight, with no unsightly gaps . . . messy patching . . . or costly heat loss—ever!

Fibrocel speeds installation, too! It is light in weight and a pleasure to apply. It cuts cleanly, easily with a knife. And its firmness and remarkable dimensional uniformity assure tight, smooth joints . . . and an overall finished appearance that's as neat, round, and true as the pipe itself.

For complete information on Fibrocel—get your free copy of the new 8-page folder, IN-155A. It includes physical properties, insulating characteristics, sizes and thicknesses available. Why not send for it today. Address Johns-Manville, Box 14, New York 16, New York. (In Canada, Port Credit, Ontario.)

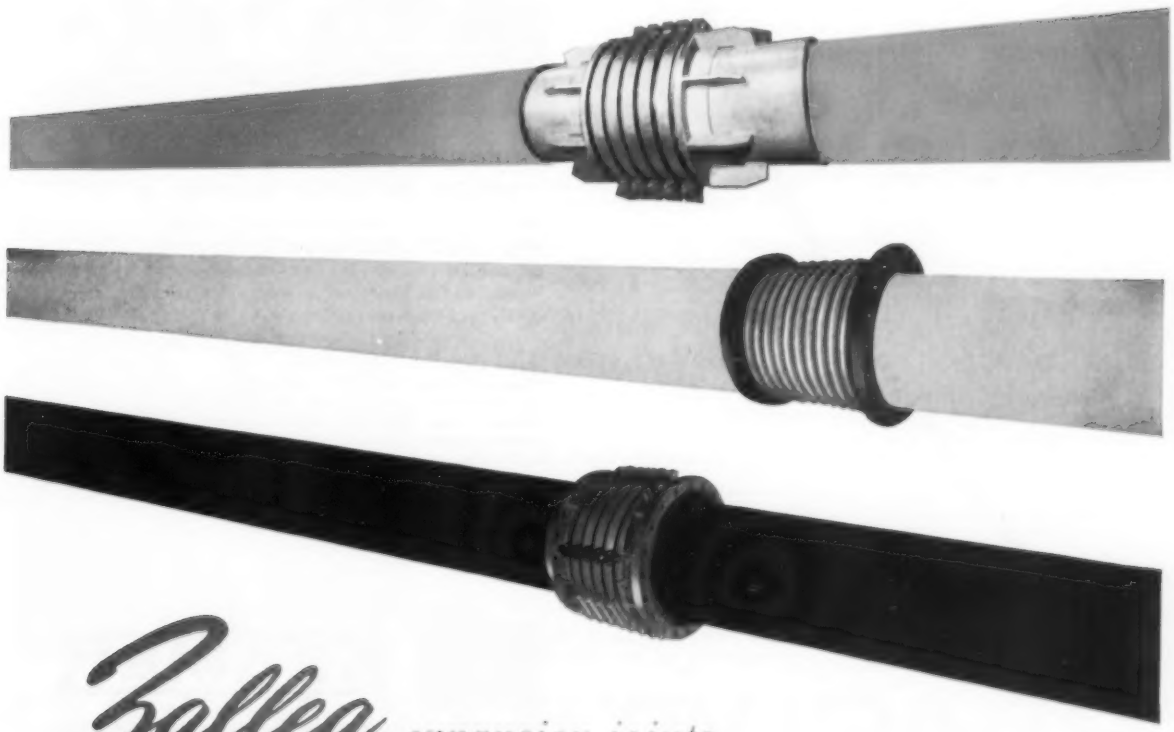
Johns-Manville *first-in* **INSULATION**

MATERIALS · ENGINEERING · APPLICATION

The true cost of an expansion joint is not the figure on the manufacturer's price tag. Many factors enter into any such cost determination. For example, an expansion joint that fails just when it shouldn't could wreck a plant and cost a small fortune. And, assuming equal first-cost of any two competitive manufacturers' designs, one that stands up twice as long as the other . . . costs only half as much on a unit-time basis. So, one really shouldn't count on "price" as a measure of value.

But here is one thing you can count on. Every single expansion joint in the Zallea line is designed and built to assure maximum reliability —and top value for your dollar. This is no empty boast, but a fact that can be confirmed for you by figures.

So, whenever you have problems—or needs—relating to expansion joints, don't fail to get in touch with Zallea. Write today for Bulletin 351, containing condensed descriptions of the many types. There is a Zallea joint for every requirement.



Zallea *expansion joints*

ZALLEA BROTHERS, **816** LOCUST STREET, WILMINGTON 99, DELAWARE

World's Largest Manufacturers of Expansion Joints

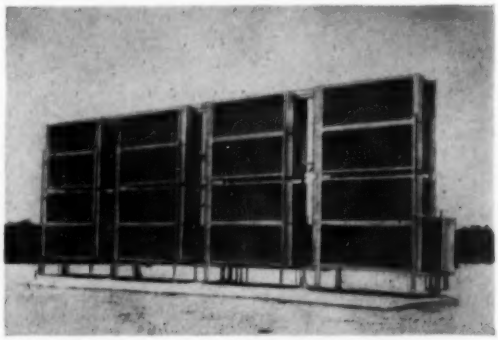
100 TON BARRIER

Crashing the 100 ton barrier

with KRAMER

UNICON

in semi-tropical climate



UNICON SUCCESSFULLY MET THE TEST THROUGH THE SEVERE SUMMER OF 1955

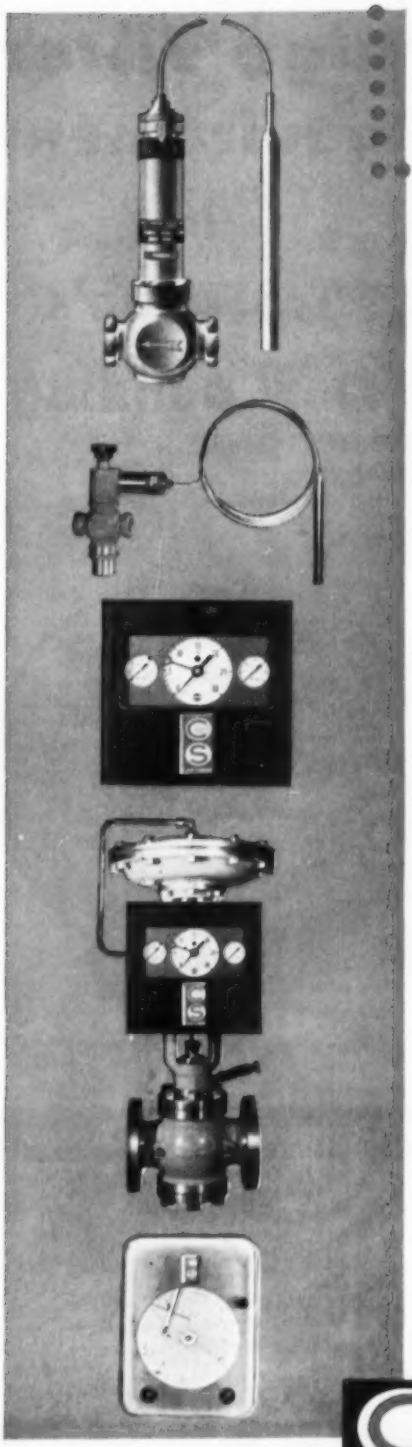
You, too, can crash the big tonnage barriers with UNICON, the industry's finest remote-type air-cooled condenser. Put Kramer's 18 years of "treasured know-how" in the proper use of air as a condenser coolant to work for you.

Photo of Kramer UNICONS mounted on roof of Handy-Andy Supermarket in San Antonio, Texas, used with 100 ton air conditioning system. Supplied through United Supply Co., of San Antonio and installed under the direction of Harold Vogt.

Write for Bulletin U-210-L

KRAMER

KRAMER TRENTON COMPANY
Trenton 5, New Jersey



For Accurate, Reliable Temperature Control

STACON V SERIES
Self Operating Temperature Regulators—

Feature a liquid filled thermal system for high operating power and uniform throttling action and has built-in over-load protection. Available in 50°F. and 100°F. ranges from 25° to 325°F. Direct and reverse acting units ¼" to 1½" with screwed ends, and 2" to 4" with flanged ends. Bulletin No. 500. (Cash Standard Stacon Corp.)

STACON TYPE VS
Temperature Safety Regulators—

Used in the supply steam or gas line and will protect a process by snapping shut when the process temperature goes above a desired temperature level. Easily adjustable and remains closed until manually reset. Available in sizes from ½" to 1½" with screwed ends. (Cash Standard Stacon Corp.)

CASH STANDARD TYPE 51
Indicating Controllers—

An air operated, mercury actuated proportional temperature controller. Temperature ranges from —40°F. to 1000°F. Calibrated set point adjustment, unit construction, air relay with sapphire orifice and push button cleaner, feedback type proportional control with 1-100% band and differential gap. Also available with 1-150% proportional band combined with automatic reset action. Bulletin No. 978. (A. W. Cash Co.)

CASH STANDARD TYPE 30
Diaphragm Control Valve (With Type 51 Mounted)

A rugged, dependable control valve—available in sizes ½" to 12" with various styles of inner valves—reverse or direct acting. Accurate control is assured when the Type 30 is used with 51 or 57 controllers, valve mounted as illustrated, or where the controller is installed remotely. Bulletin No. 980. (A. W. Cash Co.)

CASH STANDARD TYPE 57
Recording Controllers—

An air operated temperature controller with mercury, vapor, gas or organic liquid actuation. Temperature ranges from —350°F. to 1200°F. Available in 9" and 12" case size, spring or electric driven chart drive, on-off control or 1-100% proportional control.

All units have push button nozzle cleaner; proportional controllers also have sapphire jewelled relay orifice with push button cleaner. Bulletin No. 979. (A. W. Cash Co.)

WHAT'S *YOUR* TEMPERATURE CONTROL PROBLEM?

Cash Standard and Stacon have the answer or will find one.

Contact the Cash Standard temperature and pressure control specialist in your area, or write Dept. B.

CASH C S **STANDARD**

A. W. Cash Co. and Its Subsidiary, Cash Standard Stacon Corp.
P. O. Box 551, Decatur, Ill.

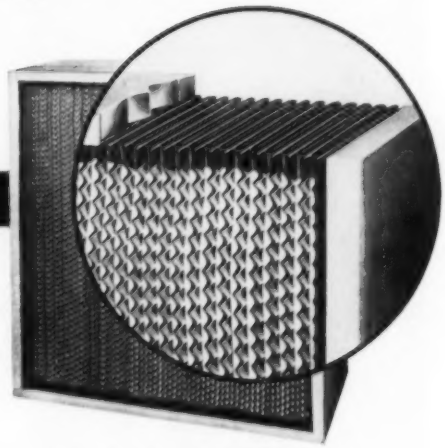
PRESSURE HYDRAULIC TEMPERATURE PROCESS AND COMBUSTION CONTROLS

A Specific Cambridge Filter for Each Specific Requirement in Tracerlab's New Building

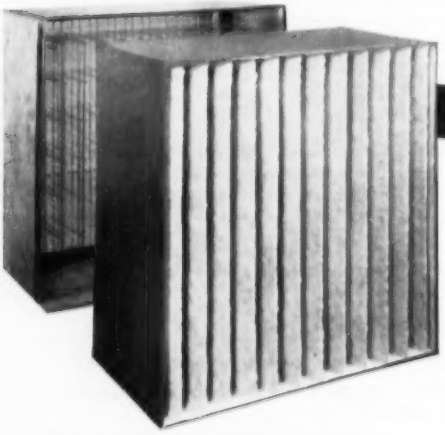
The new Waltham, Mass. plant of Tracerlab, Inc., pioneers in isotopes, nucleonics and X-ray, will be the most modern nuclear instrument plant in the world and will contain the world's largest commercial radiochemical facilities. For safety and product quality, a wide range of air filter efficiencies are required. Only Cambridge was able to supply the right filters for each requirement.

For Removing Radioactive Particles...

Cambridge ABSOLUTE Filters safely remove all hazardous particles from radiochemical areas in the new Tracerlab plant. Absolute filters, specifically developed for the A.E.C., have been used for many years in the removal of radioactive particles. Each filter provides a guaranteed efficiency of 99.95% on particles of 0.3 micron (.0000118") diameter



Cambridge ABSOLUTE Filter



Cambridge AEROSOLVE Filter

...For Clean Air in Non-Radioactive Areas

Cambridge AEROSOLVE 85 filters are used in critical manufacturing and assembly areas. AEROSOLVE 35 filters are used in other manufacturing and office areas.

Aerosolve Filters cover quality comfort air cleaning as well as a wide range of critical industrial requirements. Filter efficiencies from 35% to 95%* are available. These filters remove both visible and invisible (below 10 microns) smudge-producing particles.

**Based on the National Bureau of Standards (N.B.S.) Discoloration Test on Atmospheric Dust.*

Cambridge filters cost less than any other filter of comparable efficiency. Write for complete information.

CAMBRIDGE FILTER CORP.

Pioneers in High-Efficiency Air Cleaning

732 E. Erie Blvd. Syracuse 3, N. Y.

Representatives in Principal Cities

Refreshing to the Eye, too!

OVER **5** MILLION

Curtis prospects...

Your prospects

saw this full-color sales message

in
The Saturday Evening
POST

In a new, aggressive and *continuing* national advertising campaign to increase sales of Curtis equipment, this full-color sales message in the Post was driven home to more than 5 *million prospective buyers* of Curtis packaged air conditioning units.

If you are not a Curtis Dealer, and if you're qualified, *now* is the time to get started! You'll be selling the world's finest air conditioning equipment, *competitively* priced, and backed by a promotional-minded, on-the-go manufacturer with a solid 102 years of experience and skill.

Write today, and we'll show you how you can increase sales *and* profits with a complete, flexible line of Curtis Air Conditioning equipment.

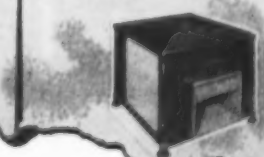
yes...

this beautiful Curtis Air Conditioning Unit deserves to be seen!

No question about it. The new CURTIS packaged air conditioner *is* refreshing. It is also silent, dependable, efficient and economical to ... and operate. It *refreshes* by circulating ...mes of clean, crisp, dry, cool air ... CURTIS packaged ... a wide ...

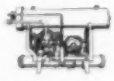
...and where water is a problem...

here's the answer!



Remember you can count on our 102nd year **Curtis**

Packaged air cooled air conditioning units


Packaged liquid chiller up to 100 tons

Industrial air compressors

Auto Lifts single & two posts

MANUFACTURING CO.
Refrigeration Division
1950 Kienlen Ave., St. Louis 20, Mo.

CM-15

BRUNER
INDUSTRIAL WATER SOFTENERS

BRUNER
WATER SOFTENERS & FILTERS

ARE FREQUENTLY

Specified

BY LEADING ARCHITECTS
FOR IMPORTANT
INSTALLATIONS!

STATLER HILTON HOTEL, Dallas, Texas
Architect: William B. Tabler, New York, N. Y.
Consulting Engineers: Jaros, Baum and Bolles, New York, N. Y.
Plumbing Contractor: Brown and Olds Plumbing Co., Dallas, Texas

KANSAS STATE OFFICE BUILDING, Topeka, Kansas
Architect: Kansas State Architect's Office
Plumbing Contractor: Sheahan and Degan, Inc., Topeka, Kansas

ST. LUKE'S HOSPITAL, Mil...
Architect: Gerrit J. de Gelleke..., Milwaukee, Wis.
Plumbing Contractor: William ... Co., Milwaukee, Wis.

Automatic Industrial Type Water Softener

These important new public buildings are serviced by Bruner industrial water softeners. Bruner softeners, filters and other water conditioning equipment are available from stock in most types and sizes. Custom installations are built to exact specifications.

You'll find Bruner equipment now installed in public and private buildings, large and small, in all 48 states and in seven foreign countries. Uses range from small laundries and schools to hospitals and atomic energy plants. Bruner is proud of its customer service — famous for product quality.

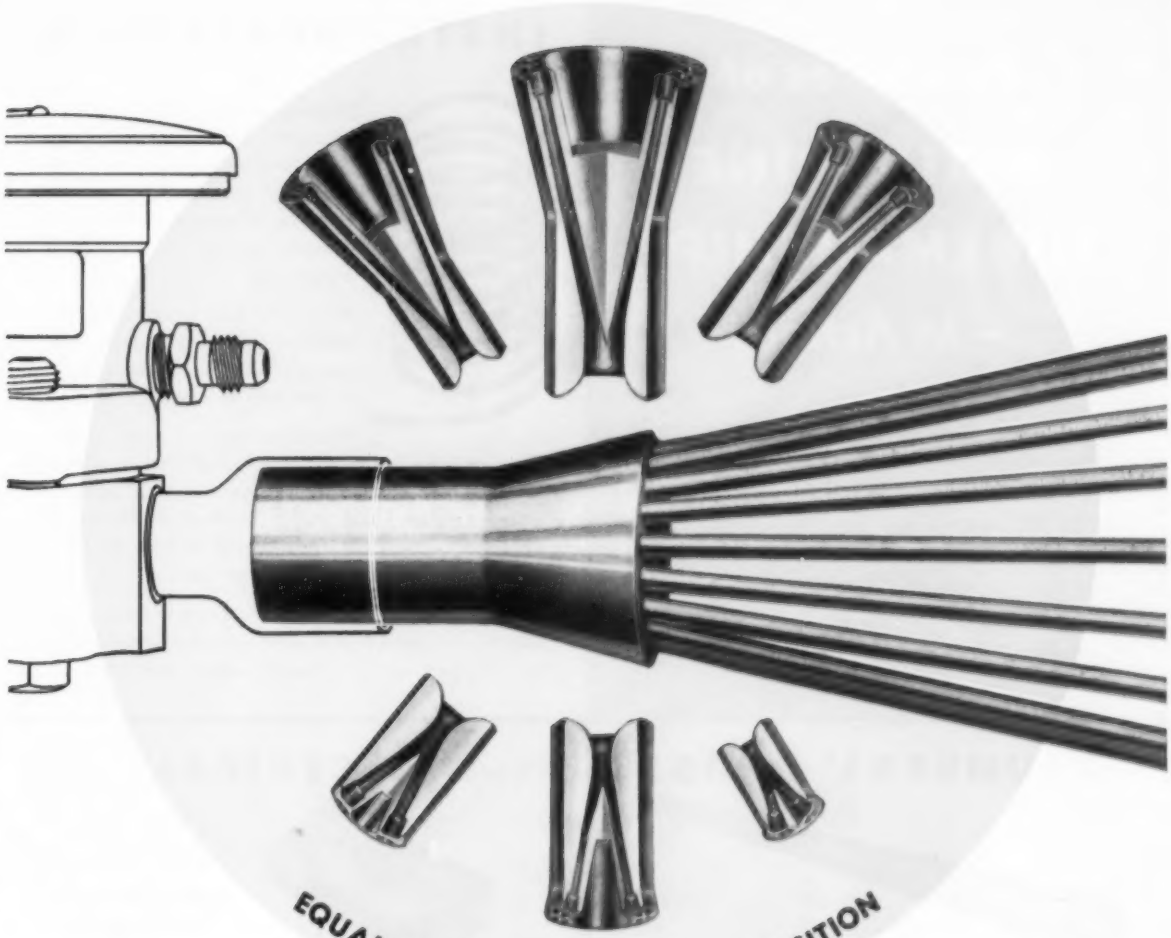
Your inquiry is earnestly solicited. No obligation, of course.

BRUNER CORPORATION

America's most complete line of quality water softeners and filters

Executive Offices: 4763 N. 32nd St., Milwaukee 9, Wis.

Plants: Milwaukee, Wisconsin, and Santa Barbara, California
Sales and Engineering Offices in all principal cities.



one-piece ALCO venturi-flo distributor

Low pressure drop—Permits closer, more economical thermo valve sizing.

Wide application range—from 25% of capacity to 150% of rated capacity.

One-piece—No nozzles or orifice plates to stock and install.

One Venturi-Flo replaces distributors requiring as many as 6 or 7 nozzles!

Easy to select—No nozzles to size.

BUY QUALITY—BUY ALCO WRITE FOR BULLETIN 188-55

SEE YOUR ALCO WHOLESALER

ALCO VALVE CO.

861 KINGSLAND AVE. • ST. LOUIS 5, MO.

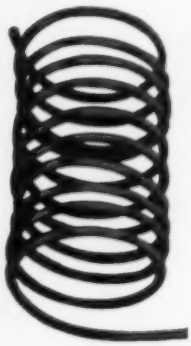
Designers and Manufacturers of Thermostatic Expansion Valves; Evaporator Pressure Regulators; Solenoid Valves; Float Valves; Float Switches.

7043

Examples of WOLVERINE TUBEMANSHIP* *— In Action!*

*Tubemanship is Wolverine's name for a special ingredient that goes into every Wolverine product. It consists of experience, rigid quality-control, sound engineering and constant research. It is your guarantee of tubing and services that will meet every expectation. For complete information write for copies of Wolverine Commercial and Condenser Tube Catalogs.

INSTRUMENTATION



Looking for rigidly quality-controlled, small-diameter tubing —the kind that can bring a new degree of accuracy to the manufacturing of gauges, instruments, pressure control and recording equipment?

Wolverine can supply exactly the tube you need from a wide range of sizes and alloys in both copper and aluminum.

Wolverine has had years of experience in the production of this type of tubing—has, for example, supplied the refrigeration and air conditioning industry with millions of feet of Wolverine Capilator®—the plug drawn capillary tube for precision metering of liquids, gases and air.

Where utmost accuracy and cleanliness is demanded Wolverine is equipped to wash, burr, and individually flow-test small diameter tubing to customer specifications.

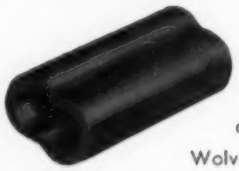
PLUMBERS' BRASS

Your reputation for top quality, plumbers' tubular brass goods is enhanced when your products are manufactured from top quality tubing.

Wolverine's years of tubing experience, its rigid quality control and its adherence to customer specifications have made it a leading producer of 70-30 yellow brass tube.

Wolverine yellow brass tube is available in a wide range of diameters and wall thicknesses. Remember, too, that Wolverine's know-how and fabrication facilities can help save you time and money in the production of tubular-shaped parts.

ELECTRICAL



To manufacturers supplying the electric and power markets, Wolverine Tube is a prime source of tubing and tubular shaped products.

Wolverine products for the electrical industry include finned and prime surface condenser tube (for transformer coolers and other applications), and copper and aluminum commercial tube in a wide range of sizes and alloys for such components as connectors, tubular switch gear and control equipment.

Wolverine also produces time and material saving extruded aluminum shapes. If your requirements call for fabrication, Wolverine is equipped to fin, spin, bend, coil, flare, expand, etc.

DIVISIONS OF CALUMET & HECLA, INC.

CALUMET DIVISION
WOLVERINE TUBE DIVISION
CANADA VULCANIZER & EQUIPMENT CO., LTD.
FOREST INDUSTRIES DIVISION
GOODMAN LUMBER CO.

WOLVERINE TUBE

Division of Calumet & Hecla, Inc.

1461 Central Ave., Detroit 9, Mich.

Manufacturers of Quality-Controlled Tubing and Extruded Aluminum Shapes

5467

PLANTS IN DETROIT, MICHIGAN, AND DECATUR, ALABAMA. SALES OFFICES IN PRINCIPAL CITIES

EXPORT DEPARTMENT, 13 EAST 40TH STREET, NEW YORK 16, N. Y.

You are looking
at today's
"miracle" air filtering material

Turn the page and
see its end-result:
the most successful air filter
ever offered to business and industry.

American Air Filter Company, Inc.
Louisville, Kentucky

The one-and-only AAF Roll-O-MATIC

MAINTENANCE: Maintenance as simple as changing film in your camera

OPERATION: Operation is completely automatic

COST: Cost of operation just half that of disposable filters

No other product in the history of air filtration has ever received the immediate acceptance, gained the overwhelming preference of AAF's amazing Roll-O-Matic. Here are some of the reasons why it has emerged in just a few short years as America's most *successful* filter:

"MIRACLE" MEDIA. Exclusive Roll-O-Mat media offers the dust-holding capacity of a viscous filter, *yet handles like dry-type media.* And a 65 ft. length of this fluffy blanket of bonded glass fibers compresses to paper-like thinness . . . measures only 13" in diameter on the roll. Specially-developed AAF viscosine (for precharging media) retains its jelly-like consistency under an unusually wide range of temperature and humidity conditions.

AUTOMATIC PERFORMANCE. There are no dust disposal problems with Roll-O-Matic. They're rolled away as the automatically renewing media moves down the face of the filter. Maintenance involves simply replacing the soiled media roll with a new one, and most users have found that even this simple act is required only *once a year!*

LOW-COST OPERATION. Renewable Roll-O-Mat media is inexpensive, too. Under normal conditions, operating cost of the Roll-O-Matic is just *half* that of disposable filters. Call your local AAF representative for details, or write for Bulletin 248A.

CLEAN AIR BY THE ROLL! Man points to clean media being automatically introduced by the Roll-O-Matic in the Clark Equipment Company plant in Benton Harbor, Michigan. Architects and engineers: The Austin Company.

AIR FILTER!

SUPER-CLEAN AIR! Roll-O-Matic filters are used in combination with AAF's Electro-Cell precipitators to supply 158,000 cfm of super-clean ventilation air for the new Lutheran Brotherhood Building, Minneapolis, Minnesota. Architects: Perkins & Will; Engineer: E. R. Gritschke.

AAF Herman Nelson

American Air Filter
COMPANY, INC.

373 Central Avenue, Louisville 8, Kentucky
American Air Filter of Canada, Ltd., Montreal, P. Q.

AAF Dust Control Equipment

Illinois Heating Specialties

— BETTER AIR IS OUR BUSINESS —

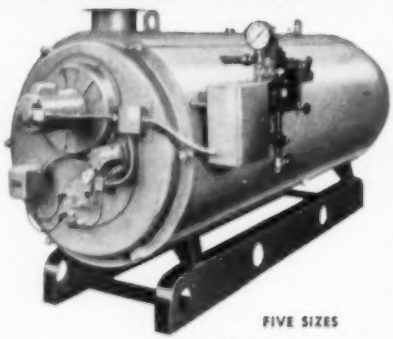
Herman Nelson Unit Heaters

Herman Nelson Unit Ventilators

NEW *Progress* package eliminates "scatter buying" and installation delays of built-up jobs

• Contractors profit with Progress packaged boilers because they simplify boiler planning, purchase, and installation in four important ways: (1) *Save time* — you place *one* order . . . at *one* source . . . get *one* delivery . . . make *one* installation. (2) *Avoid confusion* — you end "parts" buying and tedious on-job assembly. (3) *Eliminate call-backs* — you install a fully fire-tested, smooth running boiler at the outset! (4) A *Finished Package* — you know it's built and backed by a single responsible manufacturer.

Get the complete facts — find out for yourself how to make more money with the new Progress "package."



FIVE SIZES

Up to 1,340,000 BTU Output. Steam or Hot Water, Gas or Oil Fired. Sold through Wholesalers Only.

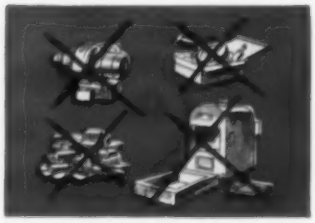
Shipped direct to the job — ready for immediate installation. Base frame sets solidly on any floor. Completely wired — just make service connections. Cleaver-Brooks starting service representative places boiler into operation and trains attendant.

Cleaver Brooks
Progress
Packaged Boiler

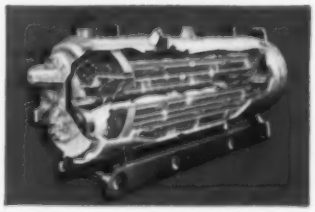
Contractors, engineers, architects, users—write NOW for full details on America's most modern boiler — in step with progress . . . way ahead in design. Ask for catalog AD-157.

Backed by the Unmatched Experience of Building Many Thousands of Successful Packaged Boilers

• PROGRESS boilers are products of Cleaver-Brooks Company, originators of packaged boilers — the first boilers in their class built to quality standards of costly industrial boilers. Featured are: four-pass, forced-draft design, electronic controls, soft-flame start, clean-burning, quiet operation, guaranteed 80% efficiency. You benefit from specialization in *every* phase of design, manufacture, quality control and final testing.



The "scatter-buying" way—multiple components. Wastes time and causes on-job confusion. With built-up boilers you have no single centralized responsibility — consequently call-backs are more frequent.



The Progress way to more heating profits. A completely integrated package — boiler, burner, controls and insulation — ready to install. Complete unit approval — bears the Underwriters Laboratories label.

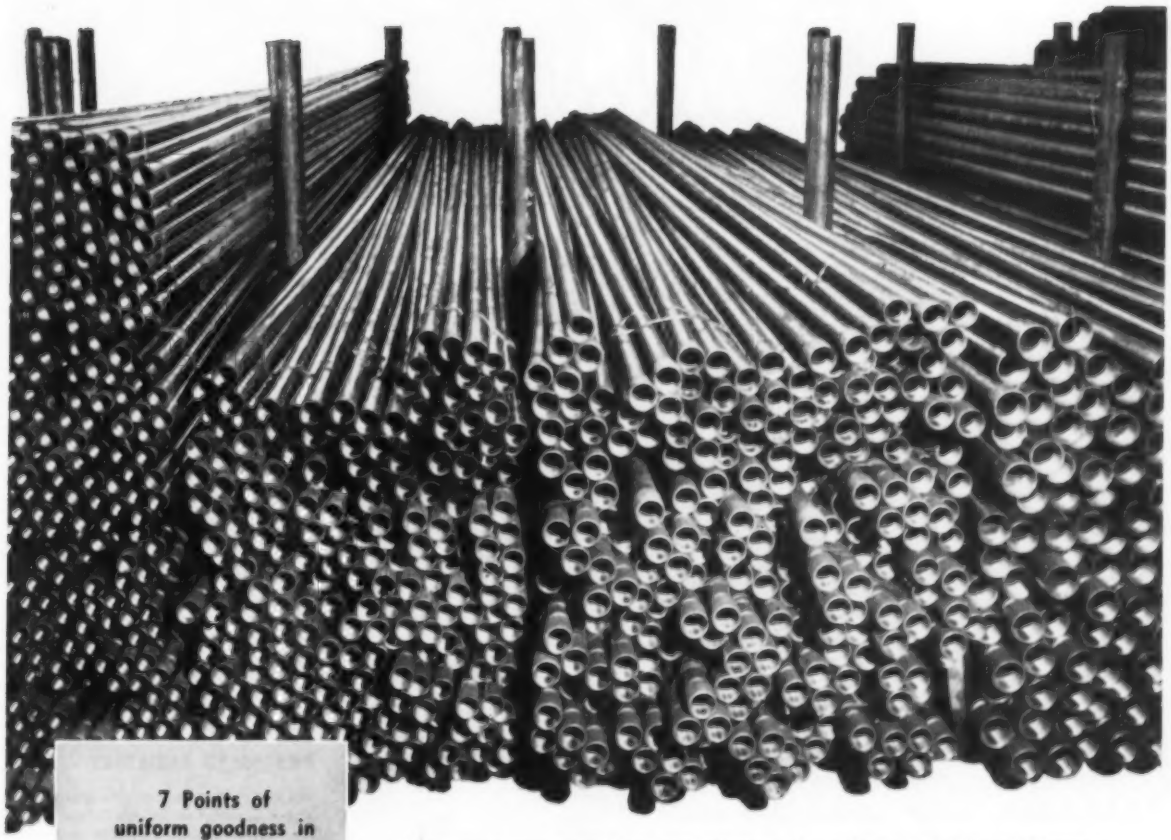
Free starting service. After installation — final check and adjustment of boiler are made by authorized service representative. Attendant is also trained in operation and maintenance — at no extra cost.

CLEAVER-BROOKS COMPANY
DEPT. L, 311 E. KEEFE AVENUE
MILWAUKEE 12, WISCONSIN

UNIFORM LENGTHS OF YOUNGSTOWN PIPE

make your job easier, quicker

. . . yet more efficient



7 Points of uniform goodness in YOUNGSTOWN PIPE

- uniform ductility
- uniform lengths
- uniform threading
- uniform weldability
- uniform wall thickness and size
- uniform strength and toughness
- uniform roundness and straightness

You may compare the importance of uniform lengths of Youngstown Pipe with having the right tool for a job . . . the right nut for a bolt . . . the right washer for a fitting. There's no lost motion. The length you specify is the length you get.
Combine this with the 6 other points of uniform goodness in Youngstown Pipe and add the fact that Youngstown is made only of the finest steel, quality controlled from ore to finished product, and you have a real prize winner! Be sure to specify Youngstown on your next order.

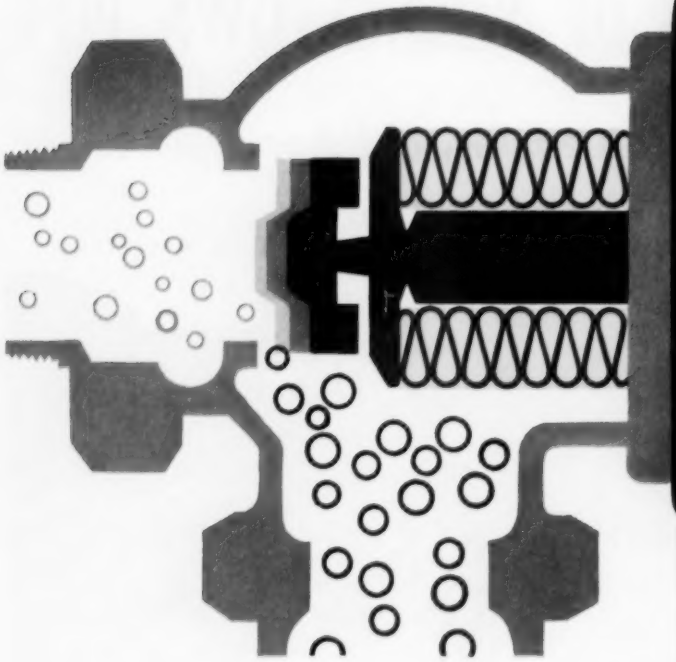
Youngstown PIPE

QUALITY YOUNGSTOWN SERVICE

THE YOUNGSTOWN SHEET AND TUBE COMPANY *Manufacturers of Carbon, Alloy and Yoloy Steel*

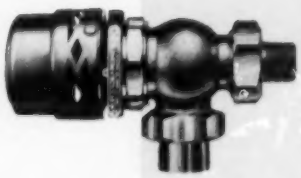
General Offices Youngstown, Ohio District Sales Offices in Principal Cities

SHEETS · STRIP · PLATES · STANDARD PIPE · LINE PIPE · OIL COUNTRY TUBULAR GOODS · CONDUIT AND EMT · MECHANICAL TUBING · COLD FINISHED BARS · HOT ROLLED BARS · WIRE · HOT ROLLED RODS · COKE TIN PLATE · ELECTROLYTIC TIN PLATE · BLACK PLATE · RAILROAD TRACK SPIKES · MINE ROOF BOLTS



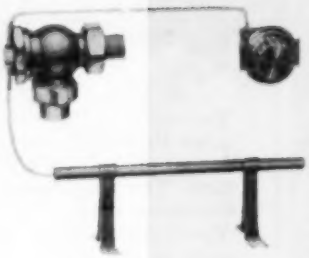
Anyone can afford room temperature control the Fulton Sylphon way

With Fulton Sylphon Automatic Radiator Valves, individual room temperature control is practical and economical for any building heated by steam or hot water radiation systems. First off, this type of control costs less than most. Your installation costs are lower because there is no electrical wiring, piping, or accessory equipment. Owner operating costs are lower because these self-operated valves require no outside source of power. And unlike "on-off" controls, they *throttle* heat input *continuously*. This action not only conserves the heat supply medium, but also keeps rooms from alternating between "boiling hot" and "stone cold."



FOR EXPOSED RADIATORS

No. 885 Automatic Radiator Valve is not only self-powered, but also self-contained so that it simply installs in place of the hand valve. For either steam or hot water systems. A turn of the valve head sets it to maintain any temperature between 60° and 75° F. Packless valve eliminates maintenance problems. ½", ¾" and 1" valves. No. 885 Valve can also be used with convectors and finned pipe.



CONVECTORS · CONCEALED RADIATORS

The No. 895 Automatic Radiator Valve is designed especially for the regulating and installation requirements of enclosed steam, vapor or vacuum units. Only the control knob shows. Adjusts instantly for any temperature from 40° to 90° F. Valve is packless . . . no packing replacement problems. Valve sizes ½", ¾" and 1". Fulton Sylphon offers Model No. 522-A for hot water installations.

SEND FOR CATALOG BULLETIN TH-80

Mr Controls

Robertshaw-Fulton

CONTROLS COMPANY

FULTON SYLPHON DIVISION · Knoxville 1, Tennessee

AMERICAN BLOWER AIR CONDITIONING

l. to r. Consulting Engineer J. M. Schweiger, Planning Director R. A. Flynn, City Manager H. W. Starick, Safety Director C. W. Horlacher, and R. J. Perkins, manager of American Blower's Dayton office, review plans for the Safety Building's air handling equipment.

They're creating another "first" for Dayton

With a reputation as one of the nation's most progressive cities, Dayton, Ohio, has an impressive number of "firsts" to its credit. Dayton, for example, was among the first to employ the popular city-manager type of local government.

The conference pictured above concerns an air conditioning first for Dayton.

For, the new Safety Building—housing all police division functions and municipal courts—is the first building owned by the City of Dayton to be fully air conditioned.

American Blower is a major supplier of air handling equipment for air conditioning and heating and ventilating in the Safety Building. Indoor temperatures are pleasantly fresh and cool—thanks to the efficient operation of American Blower air handling equipment which handles a portion of the air conditioning load.

The Dayton Safety Building's system is another example of the quality products combined with helpful on-the-spot local service you get when you specify "American Blower." American Blower Corporation, Detroit 32, Michigan. In Canada, look for Canadian Sirocco products.

Safety Building, Dayton, Ohio. Owner: City of Dayton. Associated Architects: Harry I. Schenck; Lorenz & Williams; Freeman A. Pretzinger. Consulting Engineers: Schweiger, Heapy & Associates. General Contractors: Frank Messer & Sons, Inc. Mechanical Contractors: Huffman & Wolfe Company.

AMERICAN BLOWER

Division of AMERICAN-Standard

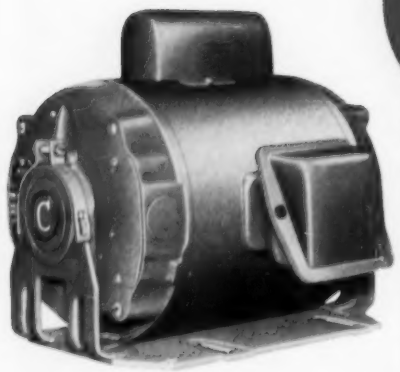
Air conditioning equipment for every business

Your choice of normal or low starting current...

with Performance-Rated

Century

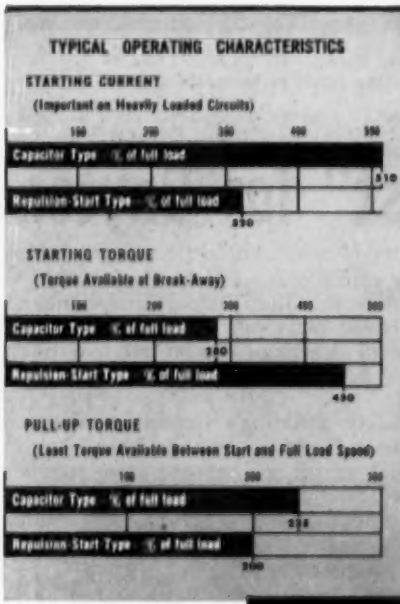
HIGH TORQUE, SINGLE-PHASE MOTORS



Capacitor Motors . . . ⅛ to 20 H.P. provide high starting torque, high pull-up torque and require normal starting current. They are available in drip proof, dust proof and explosion proof enclosures.

Even if you have severe starting current limitations, you can select the torque you need for sure starts and smooth pull-up to speed from the Century Performance-Rated Single-Phase line (see bar chart below for operating characteristics of two types of Century Single-Phase Motors).

Whatever Your Motor Job . . . there's a Century Motor Performance-Rated to handle it with top effectiveness. Contact your nearby Century branch office or Authorized Distributor.


TYPICAL OPERATING CHARACTERISTICS
STARTING CURRENT
(Important on Heavily Loaded Circuits)
100 200 300 400 500
Capacitor Type - % of full load
510
Repulsion-Start Type - % of full load
350
STARTING TORQUE
(Torque Available at Break-Away)
100 200 300 400 500
Capacitor Type - % of full load
300
Repulsion-Start Type - % of full load
450
PULL-UP TORQUE
(Least Torque Available Between Start and Full Load Speed)
100 200 300
Capacitor Type - % of full load
225
Repulsion-Start Type - % of full load
260

Repulsion Start, Induction Motors (type RS) . . . ½ to 7½ H.P. provide very high starting torque, yet require unusually low starting current. They are available in drip proof and splash proof enclosures.

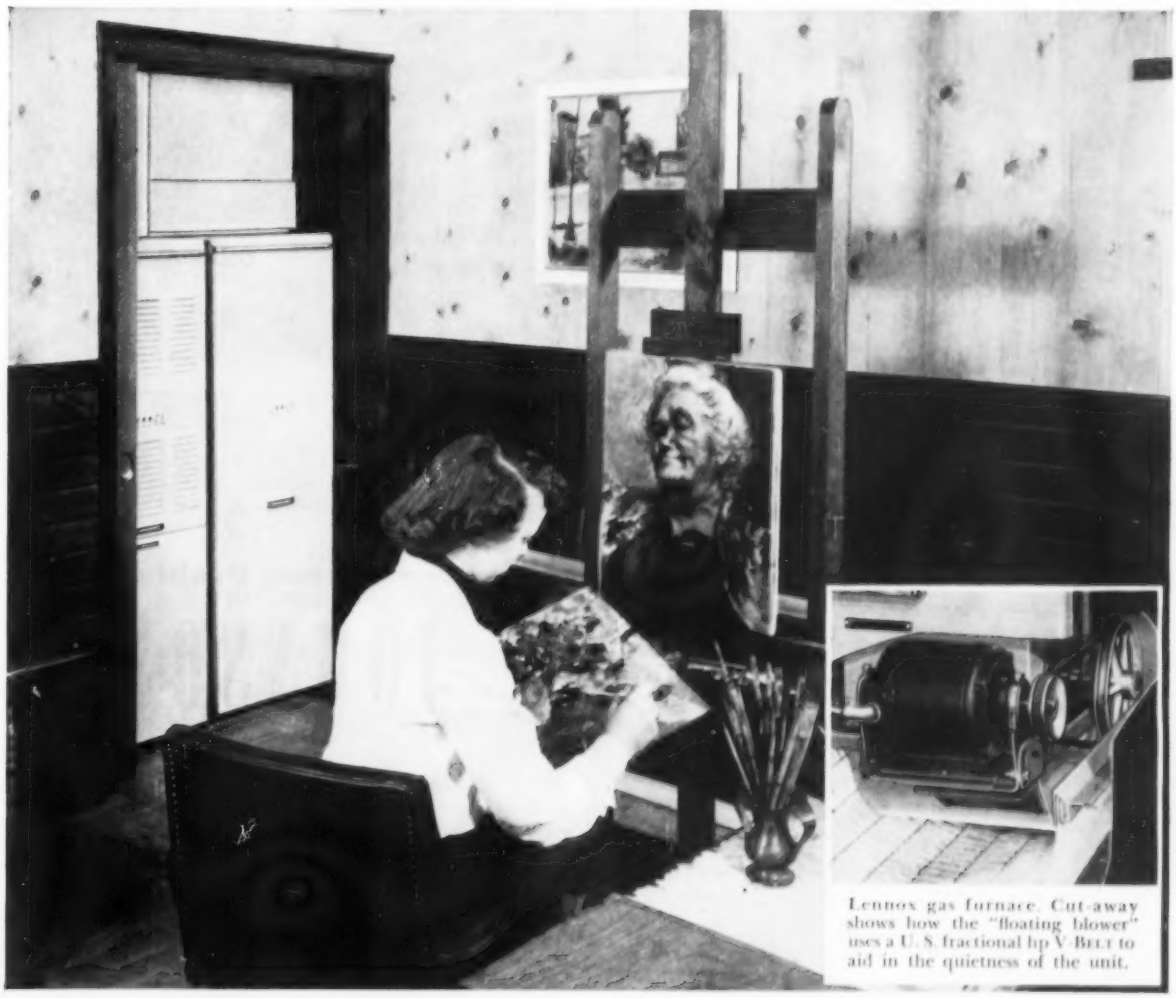
Performance-Rated®
Motors
⅛ to 400 H.P.

CENTURY ELECTRIC COMPANY

1806 Pine Street, St. Louis 3, Missouri • *Offices and Stock Points in Principal Cities*

US RUBBER V-Belts

selected by Lennox engineers for quiet operation



Lennox gas furnace. Cut-away shows how the "floating blower" uses a U. S. fractional hp V-BELT to aid in the quietness of the unit.

In the Lennox gas furnace, all vibrations are stopped dead. And because vibrations cannot possibly travel on, there's no chance of noise or rattle, not even a whisper.

The U. S. fractional hp V-BELT is a big reason.

This belt has two exclusive "U. S." developments—Electronic Tension and a new kind of molding process.

With the Electronic Tension technique each cord in the belt is built in by error-proof electronics, instead of by mechanical means. This guarantees every cord will pull its full share of the load. Belt life is prolonged.

The new molding method provides a smooth contact jacket without high spots or surface imperfections . . . making U. S. fractional hp V-BELTS ideal for appliances and high-precision machinery. It also gives U. S. fractional hp V-BELTS outstanding resistance to wear, grime and moisture penetration.

Additional information on the U. S. fractional hp V-BELT may be obtained from any of the 28 "U. S." Sales Offices or from any of the select "U. S." Distributors. Or contact us at Rockefeller Center, New York 20, N. Y.

Watch NCAA football, Saturday afternoons, NBC-TV

US RUBBER Mechanical Goods Division

United States Rubber

In America's Leading Buildings, Temperature Control Problems are

PRE-SOLVED by JOHNSON

The new 23-story Denver Club Building* is another impressive example of the exceptional comfort, convenience and economy values of Johnson-engineered Automatic Temperature Control Systems.

The first 16 floors of this modern building are devoted to tenant offices, with each floor providing some 20,000 square feet of rental space. The exclusive Denver Club occupies the upper floors, except for a penthouse apartment.

Mechanical equipment includes a 498-unit Carrier Conduit Weathermaster System, serving the perimeter offices on rental floors, and 20 central fan systems serving the core areas, stores, basement and first floors, club and penthouse areas.

Johnson Control directs all of these systems to produce satisfying, perfectly regulated temperatures throughout the entire building. Operation of all heating, cooling and ventilating equipment is coordinated to limit output to actual needs. Heating and cooling waste is eliminated.

In designing this control system, Johnson engineers *anticipated, and correctly solved,* a wide variety of control problems—problems ranging from the size of the building and the large number of systems to be controlled to the many different exposure, occupancy and usage factors involved. Thanks to this type of expert advance planning, the control system in the Denver Club Building has consistently performed up to expectations—*and from the very beginning!*

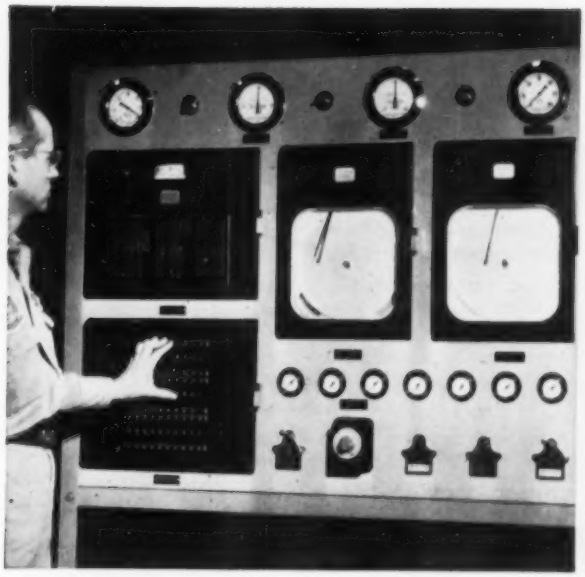
Similarly, the specialist Johnson organization can provide an equally successful control system for *any* building. Johnson engineers have pre-solved the temperature regulation problems and installed the automatic control systems for most of the nation's leading buildings, of all types and sizes.

An engineer from a nearby Johnson branch is ready to put this unmatched experience at your disposal. His recommendations are yours without obligation. Johnson Service Company, Milwaukee 1, Wisconsin. Direct Branch Offices in Principal Cities.

*The Denver Club Building, Denver. Raymond Harry Ervin, architect; Marshall and Johnson, mechanical engineers; Denver Plumbing & Heating Co., mechanical contractor; all of Denver.

JOHNSON CONTROL

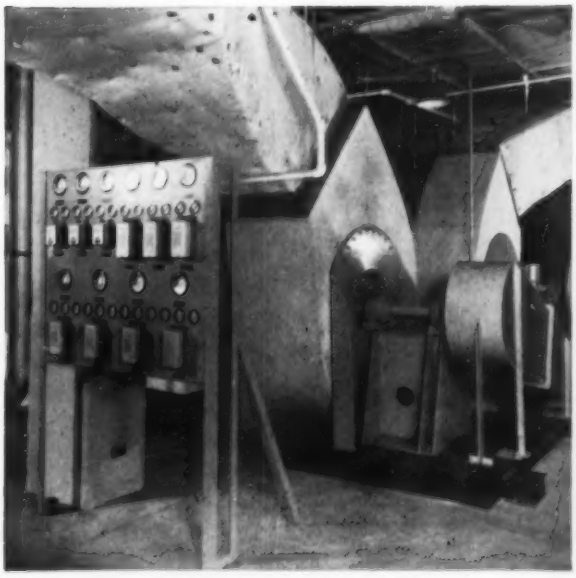
SINCE 1885



CONTROL CENTER. From this central control panel a 60-point remote temperature indicator provides an instant check of temperatures at strategic points throughout the systems and in the building. An outdoor temperature recorder, chilled water recorder-controller and summer-winter and heating-cooling changeover switches are also grouped on this panel in the engineer's office.

ROOM CONTROL. Underwindow air conditioning units in perimeter offices are individually controlled by Johnson T-271 Heating-Cooling Thermostats operating V-152 Water Valves on the heating and cooling coils. Tenants enjoy complete comfort as occupants of each office select their own personal "weather." Interior spaces are controlled by strategically located T-400 Room Thermostats.

New Denver Club Building Gets the Benefits of Ideal Temperatures, Waste-Free Heating and Cooling Operation



PRE-CONDITIONED AIR. Primary air for room air conditioning units is supplied by central air handling systems. Panel mounted Johnson controllers operate Valves and Damper Operators on the systems to maintain proper temperature and humidity of primary air. Temperatures of the hot and chilled water supplied to room units are kept in balance with outdoor temperatures by other Johnson controllers.

CLUB ROOMS. Year 'round comfort on the three upper floors, occupied by the Denver Club, is provided by sensitive Johnson Thermostats controlling six zones of air conditioning, general ventilation and baseboard radiation systems. During the heating season only the *occupied* rooms need be heated to ideal comfort levels. Rooms not in use may be maintained at low, economy temperatures.

Guaranteed TO SHUT TIGHT*

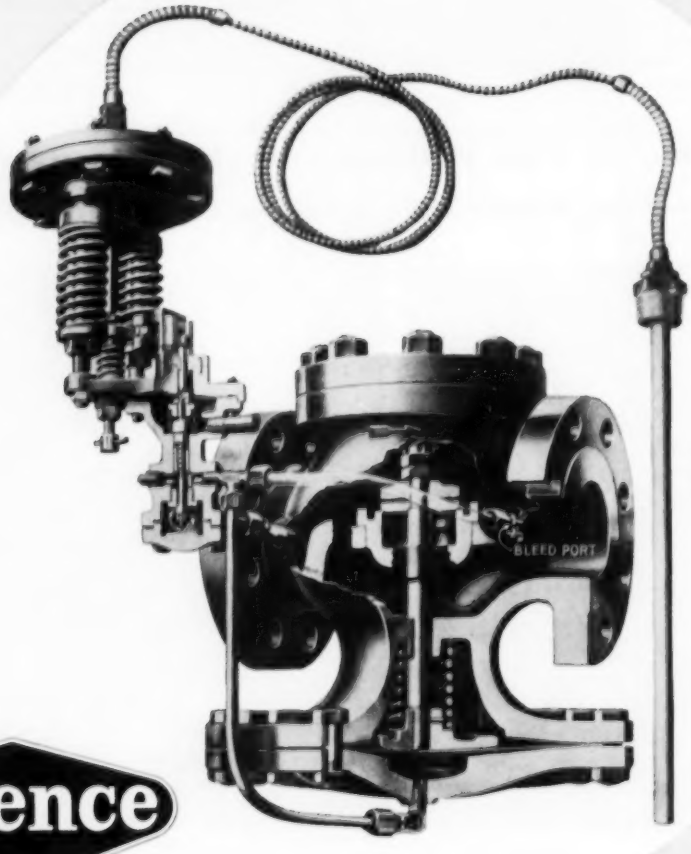
*When equipped with a SECO Metal Seat and Disc on steam service and protected by an approved Strainer, a Spence Regulator is guaranteed to shut tight when the demand for steam ceases.

Expensive steam leaks due to a lack of absolutely tight shutoff are eliminated in Spence Temperature Regulators. Here is why we can make such a guarantee:

First, our temperature regulators are of the single seat design. Seats and discs are made of durable SECO Metal. More than 20 years experience in thousands of installations has failed to produce a single case where SECO Metal has been cut by steam.

These plus other design features explain why Spence Temperature Regulators function dependably and accurately year after year without requiring expensive repairs or special attention.

Want more facts? Write for Bulletin T50 giving full details.



SPENCE
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Regulator

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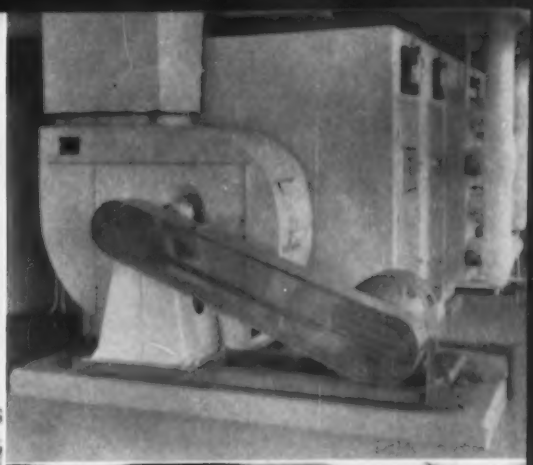
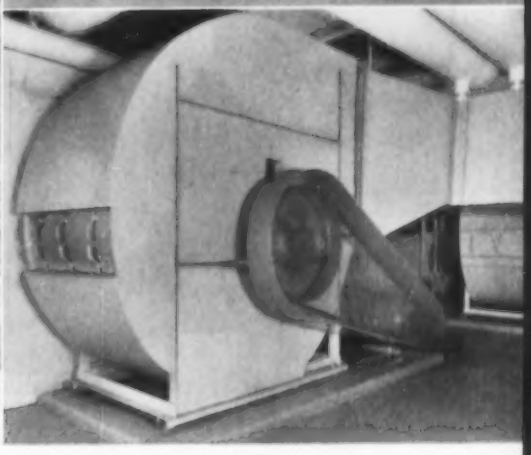
WALDEN, NEW YORK





Top Left — New Henry Ford Hospital Clinic, Detroit, Michigan. Voorhees, Walker, Smith & Smith, Architect-Engineers; R. L. Spitzley Company, Mechanical Contractors; George A. Fuller Company, General Contractors. Top Right — 4 "Buffalo" Heavy-Duty Fans handle air up to 6" SP for Carrier Corp. Weather-master System using modern high-pressure conduit distribution. Bottom Right — One of 54 Type BL Limit-Load (r) Ventilating Fans delivering from 3700 cfm at 1¾" to 30,000 cfm at ⅝" SP quietly and efficiently at Henry Ford Clinic.

OVER 100 "BUFFALO" AIR HANDLING UNITS HELP PROVIDE HOSPITAL-QUIET SERVICE AT HENRY FORD HOSPITAL CLINIC

Besides reliability, a major requirement of hospital air handling equipment is minimum noise level. This fine new Henry Ford Hospital Clinic enjoys this quiet, vibration-free operation in its "Buffalo" Fans and Air Conditioning Units, even with large installations concentrated on the 2nd, 5th and 17th floors.

In addition to the BL Fans mentioned above, this includes "Buffalo" Vent Sets, Spray Coil Dehumidifiers and Air Conditioning Cabinets, Lowboy Unit Heaters, Shortboy Ventilators, and a large number of Aerofin Heating and chilled water coils.

For your next job, specify "Buffalo", the air equipment with the "Q" Factor* that's been meeting the highest requirements of important users since 1877.

**The "Q" Factor—the built-in Quality which provides trouble-free satisfaction and long life.*

"Buffalo"

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BUFFALO, NEW YORK

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

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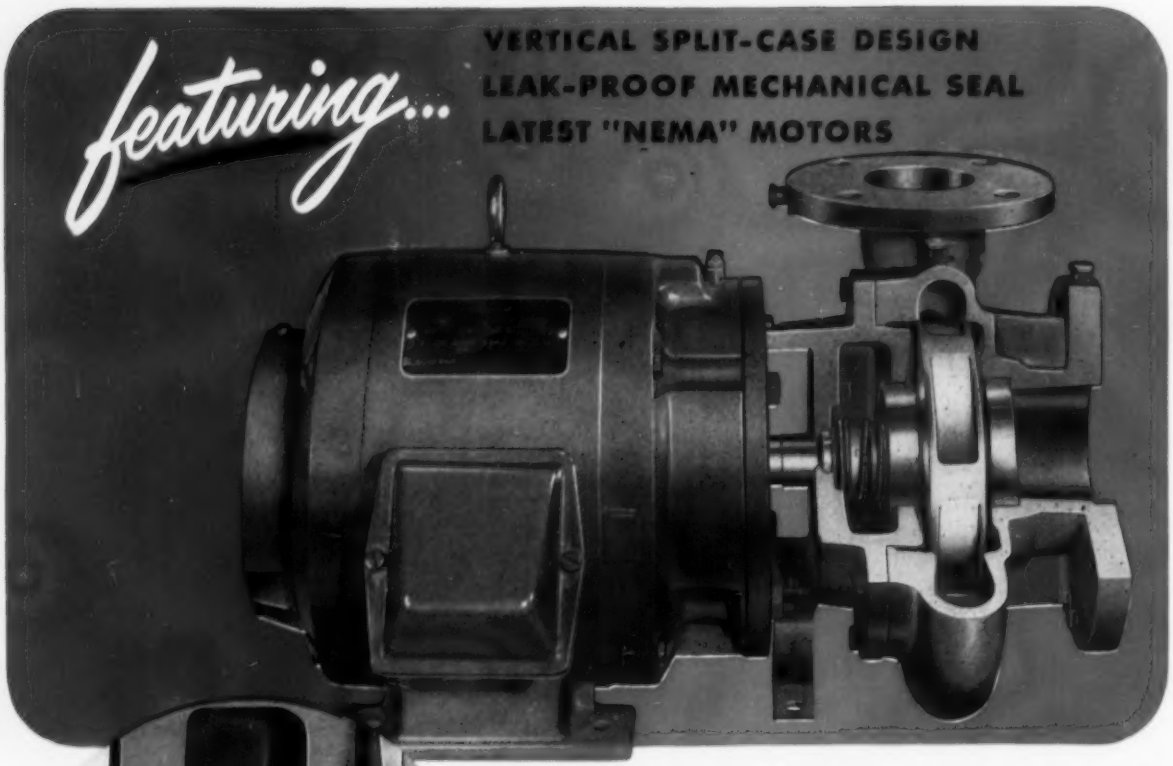
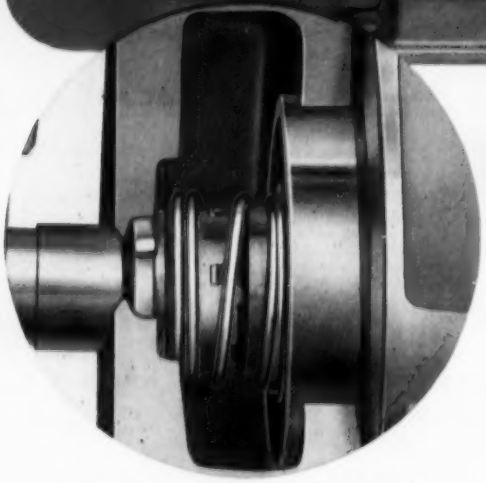




Leak-proof B&G "Remite" Mechanical Seal

FOR COOLING TOWER APPLICATIONS

B&G SERIES 1531 TYPE B

CENTRIFUGAL PUMPS

In the B&G 1531 Pump you'll find an impressive array of efficiency and performance features which will satisfy your most critical appraisal—

The Motor. Heavy duty with extra large shaft and over-sized bearings. Deep grooved radial thrust bearing counter-balances thrust load. Available *as open, splash-proof, totally enclosed or explosion-proof units.*

Motor Pump Bracket. Barrel type for maximum rigidity...counter-bored for perfect alignment. Support foot protects against vibration and strain.

Pump Shaft. High grade steel, super-finished for smooth, quiet operation and long life...oversized for minimum deflection. Gasketed sleeve protects against wear and corrosion.

B&G "Remite" Mechanical Seal. Eliminates leakage which occurs when a packing gland is used. A Carbon Seal Ring faces on a "Remite" floating seat—*a new material just a shade under a diamond in hardness*—gives trouble-free service when pumping liquid containing foreign material. The Seal is self-lubricating.

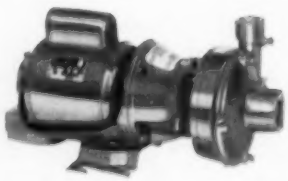
One piece volute and suction cover. Solid based with support foot. All the advantages of split-case design—no pipes to disconnect when servicing the pump. Rugged construction absorbs piping strains without transmitting stress to the motor shaft.

Impeller. Sound hydraulic design, mechanically balanced. Balance ring and relief holes reduce thrust. Precision fit on shaft assures easy removal and positive centering.

Capacities and materials. To 1100 GPM—420 ft. head. Available in all-bronze, all-iron and bronze-fitted units.

SERIES 1522 CENTRIFUGAL PUMPS

Really *quiet*...both pump and motor are equipped with *long bronze sleeve bearings!* "Remite" Mechanical Seal ends leakage troubles. Bearing bracket assembly is interchangeable. Capacities to 150 GPM—heads to 115 ft.



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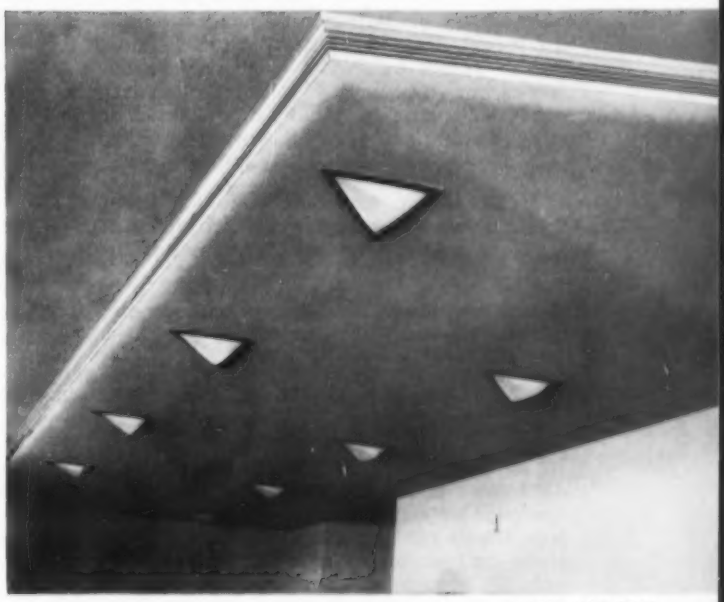
Architect:
Frank Lloyd Wright
Engineer:
Mendel Glickman
Consulting Engineers:
Collins & Gould
General Contractor:
Culwell Construction Co.

High velocity air diffusion in the Price Tower

The photograph at the right shows how Mr. Frank Lloyd Wright incorporated Anemostat Straight Line All-Air High Velocity Units in the ceiling design of the Price Tower at Bartlesville, Oklahoma. The conditioned air is supplied through continuous Straight Line Diffusers located on two sides of the suspended ceiling. The diffusers do not only have vital functional use, but also add to the esthetic appearance of the architect's design.

The Anemostat All-Air High Velocity distribution system also offers important advantages. It can be used with smaller than conventional ducts. It can be installed in less time and at less cost. It requires no coils, thus eliminates leakage, clogging and odors. Furthermore, Anemostat round, square and straight line diffusers with high velocity units are adaptable to a wide variety of architectural designs.



PHOTOS: JOE D. PRICE

See how Anemostat Straight Line All-Air High Velocity units are used in a typical office area.

Write for "High Velocity Air Conditioning: Its Effect on Building Design" to Anemostat Corporation of America, 10 E. 39 Street, New York 16, N. Y.

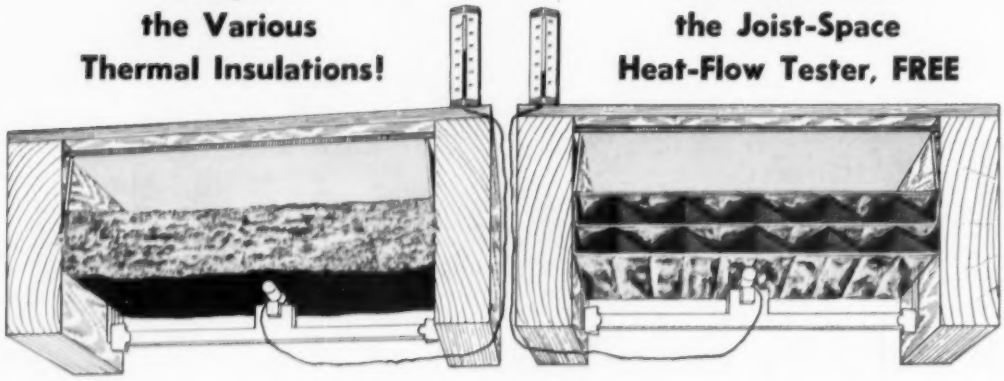
Anemostat—The Pioneer of All-Air High Velocity Systems

AC 1340

Make Your Own Tests!

Compare the Various Thermal Insulations!

We'll Lend You the Joist-Space Heat-Flow Tester, FREE



Just place it on a desk and plug in. It more closely simulates actual joists and building spaces. Heat flows from the surface of a heated panel, much the same way as heat flows from a warm floor, wall or ceiling. This tester will compare under similar conditions any 2 insulations of your own selection, for **up-heat, down-heat or wall-heat flow.**

It is simple, compact, *portable*, and has 2 identical units, with Taylor thermometers. But you can use your own thermometers; also your sense of touch.

The Joist-Space Heat-Tester employs all 3 methods of heat flow: Convection, Conduction, AND Radiation.

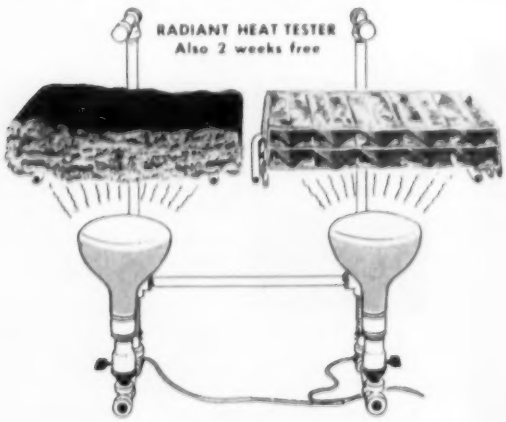
You will also be able to test and compare the full depth, *edge-to-edge* multiple aluminum insulation* which we will send you *free*. Its aluminum and fibre sheets drastically reduce outer and inner *convection*. Its multiple spaces of low-density air are very poor *conductors*. Its aluminum surfaces have a 97% reflectivity for resisting *radiation* or heat rays, and only 3% absorptivity and emissivity. Its permeability to water vapor is almost zero. Infiltration under flanges is slight. Condensation-formation is minimized on or within this scientific construction.

Also available is our Radiant Heat-Flow Tester, in which the sources of heat are heat lamps emitting infra-red heat-rays, or Radiation. This is a test of the ability of surfaces to reject the flow of infra-red heat-rays, and does not indicate insulating value against heat flow by Convection and Conduction. However, Radiation is of great importance, because it plays a major role in heat-flow across building spaces. Both Testers are available for 2 weeks free use.

Of course the **best test** of an insulation is **USE**—actual, practical, day to day, year after year performance—the record of fuel savings—comfort, winter and summer. **More than 350 MILLION SQ. FT. of Infra insulation have been installed, a good deal of it repeat orders.**

The next best test is a laboratory test.

But you can also make illuminating tests of your own, in the privacy of your office, by mailing the coupon.



*U. S. Pat. Nos. 2,750,313; 2,314,757; 2,227,385; 2,196,006; 2,101,836.

Infra Insulation, Inc., 525 B'way, N.Y.C. Dept H-10
Please send for 2 weeks free use without my assuming responsibility for damage to devices:
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The Editors' Pages

PIPE FITTING today demands increasing skill and knowledge on the part of journeymen and apprentice pipe fitters to keep abreast of changing technologies. For a report on the training of apprentices, see the article, Pipe Fitting Apprentices and Instructors Increase Skills, on p. 86, and Sam Lewis' Page, p. 85.

An example of new technology requiring better trained pipe fitters is the boiling water reactor installation described in the article, How Piping, Valves Serve Atomic Boiler Plant, on p. 92.

Although not so dramatic as atomic reactors, sprinkler piping systems for fire protection also require careful installation work of the highest quality. The question of the permissibility of welding sprinkler piping has been asked by a reader and is answered by several authorities in the field, in Question of the Month, on p. 112.

A growing interest in modern fire prevention is reported in a brief item on this page.

Nuclear Energy Property Can Now Be Insured

. . . by cooperative group

THE CAPITAL stock fire insurance business is ready to receive applications to indemnify industrial users of nuclear energy against property hazards that may arise out of reactor installations in their plants. Representatives of 150 capital stock fire and property insurance companies have organized the Nuclear Energy Property Insurance Association.

The initial aim is to have enough capacity available to insure any nuclear reactor commercial plant now planned. Tentative plans indicate a capacity in excess of $50 million for each installation. ‡

Room Air Conditioners To Be Rated in Btu's

. . . new proposal adopted

COOLING CAPACITIES of room air conditioners will be published next year in terms of Btu's, not horsepower, tons, or other units. A proposal to this effect was adopted at a recent meeting by the Air-Conditioning and Refrigeration Institute.

While Btu's have been used by some manufacturers in the past, failure to use a standard method of testing and rating has resulted in confusing the public.

Membership of the Institute's Room Air-Conditioner Section includes the manufacturers of more than 90 percent of the U.S. output of room units. ‡

Fire Prevention, Building Codes Gird Cities

. . . for fire safety

NEARLY 1000 cities in the U.S. have adopted the National Building Code, and almost 900 have adopted the Fire Prevention Code. Each year a score or more of cities enact the codes into law, extending the assurance of reasonable safety to life and property.

Since its founding in 1866, the major purpose of the National Board of Fire Underwriters has been to increase the public knowledge and practice of sound fire protection practices.

A survey of 88 cities last year showed a trend towards improvement in such facilities as water supply, building laws, structural conditions, fire prevention, fire alarm systems, and in fire departments themselves.

Also, requests for thousands of copies of the codes each year show a growing interest in modern fire prevention to safeguard lives and property against fire and explosion hazards. There is an increasing demand for the NBFU's technical standards and their incorporation into state, county, and municipal law. ‡

Air Conditioning Solves "Hot" Money Case in Turkey

. . . climatic conditions no longer curtail currency press operation

THE CASE of the "hot" money, which has long plagued the Republic of Turkey, has been solved, according to the Trane Co.

For years the official Turkey mints have been able to print official bank notes only when the temperature was 72 F and the relative humidity in the 55 percent range.

Now, with a 100 ton air conditioning system in the new Turkey Central Bank Notes Press building in Ankara, the presses can roll whenever officials give the nod.

Under controlled climatic conditions no longer will the money stick to press rollers, literally get hot or scorch, pull off in uneven sizes or "out-of-register" impressions, causing fuzzy reproduction of pictures and words.

The Turkish officials were so happy with the solution that they sacrificed a year old lamb in a special religious ceremony just as the air conditioning system's initial operating switch was thrown. ‡

HPAC Observes ABC Month With 3700 Other Members

. . . In October

As a member of the Audit Bureau of Circulations, HPAC joins with pride in the annual observance of ABC month. The ABC symbol which we have the right to use means increased service to both our readers and our advertisers.

The Audit Bureau of Circulations, founded 41 years ago, is a cooperative, nonprofit association of 3700 buyers and sellers of publication advertising. The Bureau defines, audits, and reports a basic measure of circulation value, net paid circulation, for its members.

And each year an impartial, accurate ABC audit tells us and our advertisers how HPAC has earned the cash ballots—paid subscriptions—that measure our most important function—reader service. ⫩

Grants-in-Aid Available For Air Pollution Study

. . . varied program of awards

The U.S. Public Health Service has established a grants-in-aid program to increase the number, competence, and knowledge of professional personnel engaged in the prevention and abatement of community air pollution.

Grants-in-aid for training activities relating to the study, effects, extent, assessment, or control of air pollution will be awarded to:

1) State and local government air pollution control agencies or other public agencies for training personnel.

2) Educational and training institutions for assistance in development and support of new curricula.

3) Individuals who want specialized training and instruction in the field of air pollution.

For information regarding application, requirements, and financial arrangements, write to the Chief, Division of General Health Services, Bureau of State Services, Public Health Service, U. S. Dept. of Health, Education, and Welfare, Washington 25, D. C. ⫩

John H. Reock To Direct Market Research

. . . for HPAC

John H. Reock has been named to the newly created post of sales promotion manager for the Keeney Publishing Co., publishers of HPAC.

Mr. Reock has spent the last 11 years in the air conditioning field. He formerly was manager of advertising and sales promotion for the Mueller Climatrol Div. of Worthington Corp. Prior to that he was in sales promotion work with the Iron Fireman Mfg. Co.

In his new post Mr. Reock will be in charge of market research and sales promotion in the field of heating, piping, and air conditioning. ⫩

"Quote"

"When you buy a product, you want to know if it will perform as the manufacturer says it will."— ***E. E. Trickler, vice president of sales, New York Blower Co., and recently named national committee chairman of the Air Moving and Conditioning Association's certified rating committee, on announcing the committee's new project of certifying performance ratings for air moving equipment.***

1956 Contract Awards 8 Percent Above 1955

. . . in first eight months

Contract awards for future construction in August in the 37 eastern states amounted to $2,068,754,000, 9 percent above August 1955, according to the F. W. Dodge Corp. The August total was the highest on record.

Awards in the first eight months of 1956 totaled $17,416,272,000, 8 percent above the like 1955 period. ⫩

Air Conditioning Eyes Greatest Market: Plants

. . . then hospitals, schools

Air conditioning's greatest and still untapped market lies in industrial plants, according to John E. Haines, vice president of Minneapolis-Honeywell Regulator Co. Despite the rapid growth of air conditioning in other areas, less than 1 percent of all modern factories have it.

It is predicted, however—due to competitive pressures and the need for increasing employee productivity, reducing hot weather absenteeism and raising worker health and morale—that a very large percentage of modern production facilities in this country will be air conditioned in the next few years.

During the past year, said Mr. Haines, air conditioning's greatest growth was in existing office buildings, where it was found necessary to compete with more desirable space. When 18 to 20 percent of the office space is air conditioned, all of the remaining buildings must add it in order to maintain their status.

Studies show that the average cost of air conditioning in an office building is about 1½ percent of the cost of employee's salaries. A watch factory experienced a reduction of 25 percent in "rework" after air conditioning was added.

It may soon be possible to predict accurately just how much factory production, education, and hospital patients' recovery can be helped by air conditioning, he said. This will lead to air conditioning of all modern hospitals, factories, and schools, so classrooms can be used year 'round. ⫩

Light Weight Quick Action Long Life

New Webster Series 27 Drip Trap

Here's the rugged, heavy-duty answer to condensate and air removal needs in air conditioning coils, unit heaters, fan heater coils, drips of mains, blast radiation or hot water generators. This all-new Webster Series 27 Float-and-Thermostatic Drip Trap provides these important advantages:

- Compact construction and light weight assure quick, easy installation. Light weight is achieved without sacrificing strength. While designed for 15 lbs. maximum operating pressure, the parts will withstand more than 10 times this pressure. For lower maintenance costs, complete interior is removable without disturbing piping.
- Fast action and greater water capacity are provided by the double fulcrum principle of the water valve.
- Long, trouble-free life is assured by rugged construction of stainless steel valve, seat, bracket and float lever . . . and cast-iron body and cover.

Webster Traps have earned the confidence of four generations of Heating Engineers. For details on this newest addition to the complete line, see your Webster Representative, or write for bulletin.

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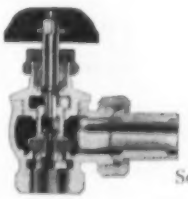
Webster Steam Specialties Meet Specifications

Series 9 Thermostatic Trap

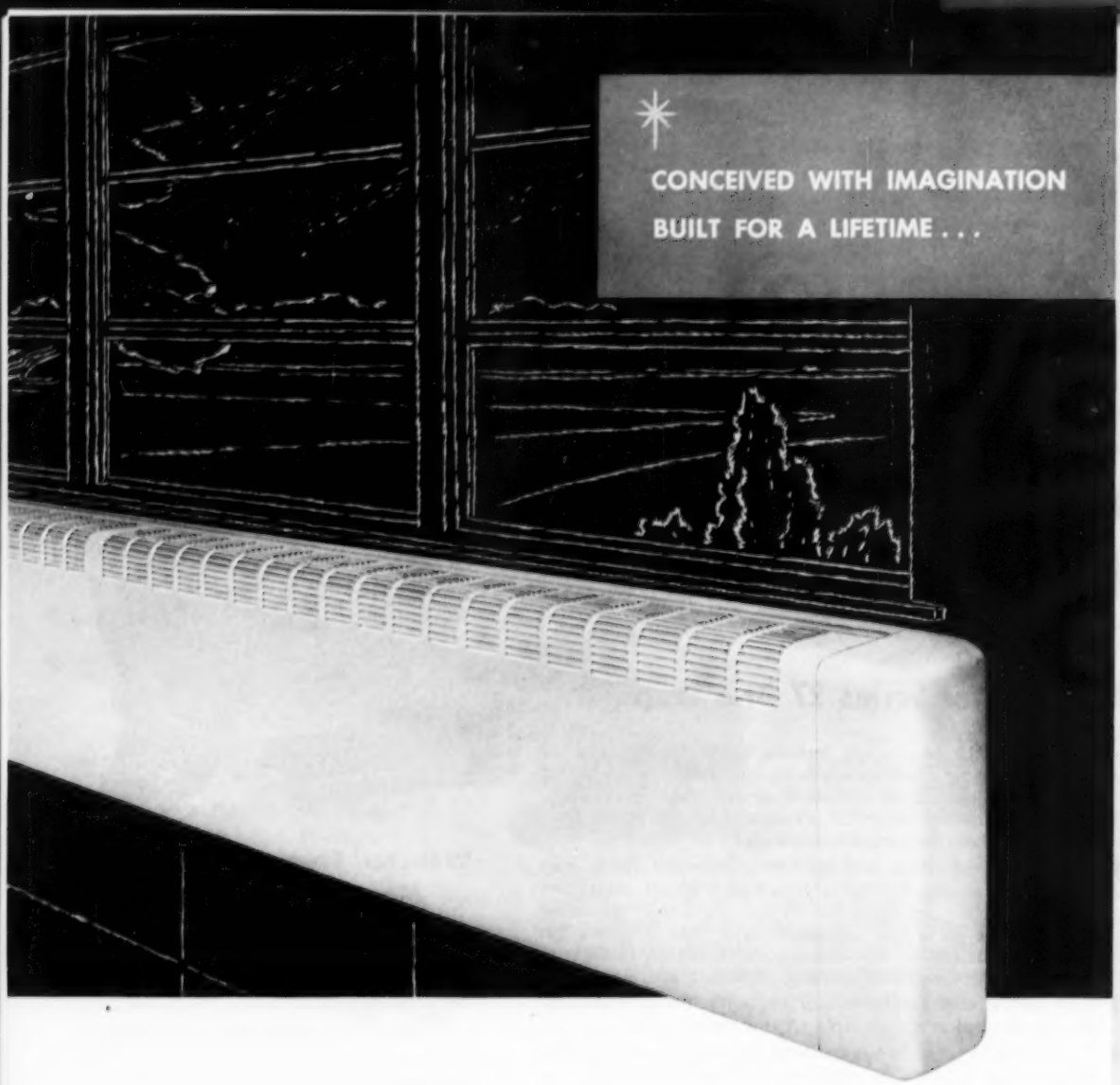


Series 10 Radiator Valve

Size 782 Dirt Strainer

Series 78 Process Steam Trap

Other Webster Steam Heating Specialties include Lift Fittings, Double Service Valves, Boiler Protectors, Expansion Joints, and Trap Attachments. Descriptive bulletins on request.



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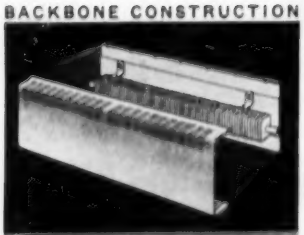

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NESBITT SILL-LINE RADIATION

"Open for Discussion"

• *WE FOLLOW HERE each month the practice at engineering society meetings of providing an "open for discussion" period. You are urged to take part. Just address your comments to the Editors, Heating, Piping & Air Conditioning, 6 N. Michigan Ave., Chicago 2.*

Finds Data Sheet on Valves Well Done; Emphasizes and Expands Some Points

THE DATA SHEET, *How to Apply, Maintain Valves*, in the August HPAC is well done. I have a few comments that might be helpful by emphasizing some of the points and expanding a bit on others.

Two causes of valve failures cannot be emphasized too strongly: misapplication and foreign matter. Many failures are unwittingly diagnosed incorrectly because the blame is attributed to manufacturing defects, poor materials, or bad workmanship. In an astonishing number of instances the valve failure is properly due to misapplication — failure to select the right type of valve for the service conditions. Users would do well to explore with manufacturers the reasons for failures.

Foreign matter contributes to more valve troubles than is recognized by many users. Scale, chips, weld spatter, sand, filings, and what have you have been removed from valves time and again when inspections are made. Valves at low points of piping are particularly susceptible. Every dollar spent in the initial cleansing of piping will pay dividends in operation and in reduction of subsequent maintenance.

Inspection and Maintenance. The article suggests a regular program of valve inspection and maintenance. This prime advice might have been put in italics and still not have overemphasized its importance. The article goes on to say that "inspections should include an examination for valve leaks." I would like to amplify "valve leaks" in more specific detail.

Inspections should focus attention on seat leakage, bonnet joint leakage, and stuffing box leakage. Any one of these can spell real trouble in short order. A good program of maintenance will correct any such leakages at an early date and usually prevent a minor repair from becoming a major operation.

A slight leak through the stuffing box can usually be eliminated by tightening the gland. If neglected, a complete repacking job is needed and in some cases a continual leak at high velocity may cause serious cutting damage to parts.

If bonnet joint leakage is neglected, you can expect cutting or wiredrawing of machined surfaces. Immediate attention will prevent this type of damage. Bolted bonnet joints of valves operating under higher temperatures should be checked for relaxation of studs due to creep. Re-stressing such studs is good preventive maintenance.

A slight nick in seating surfaces—disc or body seat—can be corrected by lapping when the leak first occurs. Failure to provide such first aid can result in severe wiredrawing of the seating surfaces and a much tougher repair job. The cutting effect of fluids through a small aperture under high velocity can add appreciably to maintenance problems.

Angle Valves. The article deals with globe valves very competently except for one small detail; no mention is made of angle valves. This brings out an interesting observation. For some strange, unknown reason, users talk and think in terms of globe valves, and seldom do angle valves get into the picture. Angle valves are overlooked so much that they are indeed sadly neglected stepchildren, and for no good reason.

There's a lot to commend angle valves. In many cases an angle valve could take the place of a globe valve plus an elbow; the angle valve would look better and reduce the number of joints.

The article cautions, "Remember, a globe valve offers more resistance to flow than a gate valve." That's true, of course, but an angle valve offers less resistance to flow than the companion globe in many types of valves. When pressure drop is important, don't overlook angle valves.

Relief Valves. In the last paragraph, the article gives some potent advice: "Trial operation reveals relief valve defects and saves lives and money."

I have seen relief valves that were taken from hot water piping after a year or more of service without ever being operated manually. I recall one relief valve, originally set for 125 psig. It was so full of a hard lime deposit that the disc was literally bonded to the seat. Even a test pressure of 400 psig failed to break the bond and open the valve. Regular maintenance and trial operation would have prevented such a potential source of danger.

G. W. HAUCK
Manager of Engineering Sales
Crane Co.
Chicago, Ill.

Will Cool, Damp Air Damage Motor Insulation? Not While Operating

REGARDING Robert S. Ash's article, *Cool Industry Hot Spots with Evaporative Coolers*, in the December 1955 HPAC, particularly the section, "Cool Electric, Diesel Motors," I wonder if the method of supplying

cooled air by evaporative coolers to the winding of motors applies to ordinary motors. I cannot help thinking that cool but damp air may not be the most suitable for motor windings and that the insulation stands a good chance of being damaged.

I asked a number of friends who are electrical engineers, but they are not able to give me a positive answer. I would therefore be most grateful for an answer as to the merit of this method and if it can be applied to any motors, especially those say around 1000 kw when the ambient temperature reaches 104 F in summer (and sometimes a little higher than that).

STEPHEN CHANG, M.D.
Department of Medicine
University of Hong Kong
Hong Kong

THE AUTHOR'S REPLY—Electric motors are generally designed to carry their rated load when the temperature of the surrounding air is 104 F. I assume that your interest in cooling motors at this temperature is the possible 10 to 15 percent overload motors will handle if they are cooled.

Although the air discharged from an evaporative cooler might be termed "wet" air—relative humidity will be in the neighborhood of 80 percent—it will lose its wetness from the sensible heat received from the motor windings. Packaged evaporative coolers manufactured in the U. S. are designed so that the cooled air will be drawn over the blower motor in the cooler.

I do not believe the cooled air will damage the motor while it is in operation. However, condensation may occur in large motors during a long shutdown if the motor is not provided with electric space heaters. If there are no heaters in the motor, it would be advisable to flush out the cooled air. This could be accomplished with a time delay relay that would shut off the water circulation in the cooler but allow the blower to run for a given time.

ROBERT S. ASH
Assistant to the President
International Metal Products Co.
Phoenix, Ariz.

Finds Clipping and Filing HPAC Articles Easy Compared to Some Magazines

WE READERS who want to cut out and file articles of interest to us have quite a job getting an article together. The way some magazines scatter an article through several pages of other material and advertisements produces nothing but a patched up affair like a crazy quilt when we get the pieces pasted together to file.

This is something your magazine seldom does, I am glad to say. But but some others are less considerate.

Another thing that makes filing difficult is the strange sizes and shapes some magazines are going back to. After the effort to standardize all standard data, etc., on 8½ x 11 in., I find the odd size piece is always a filing problem.

LEE P. HYNES
Consulting Engineer
Haddonfield, N.J.

Heating Economy Factor Must Be Widely Accepted to Be of Use

I AGREE almost entirely with Professor A. B. Algren's comments in the September HPAC regarding the "Heating Economy Factor" and would like to add a few of my own:

a) The Heating Economy Factor must be accepted as a recognized standard by agreement between all interested parties before it can be of much use.

b) Comparison of buildings using this factor can be made only between buildings of approximately the same size.

c) Heating and air conditioning engineers have become accustomed to the fact that thermal effectiveness increases as the coefficient of transmission decreases. The Heating Economy Factor is contrary to this accepted practice.

One fact I would like to point to is this: In the examples Professor Algren presents, he indicates how different factors affect the resultant coefficient and HEF. However, the important point is that a layman first would be interested in the overall comparative figure. This would indicate the thermal efficiency of the structure based on all contributing factors and requires a very simple method of comparison.

It was with all these facts in mind that I formulated the use of the "Shell Coefficient" and "Shell Area," as discussed in my article, *Thermal Ratings of Buildings Can Be Uniformly Compared*, in the September HPAC.

WILLIE HAMMER
Chief, Heating Unit
Repairs & Utilities Div.
Office of the Engineer
HQ, Army Forces, Far East

Type of High Velocity Air Conditioning In GM's Technical Center Clarified

IN THE ARTICLE, *High Velocity System Air Conditions GM Technical Center*, by Fred H. Couts in the June HPAC, mention was made that the first air conditioning system installed in the Center was found difficult to balance and presented noise problems. While this original system was not described in detail or identified, I would like to point out that it was not of the same type which our firm designed and installed after this first system was found to be unsatisfactory.

DOUGLAS W. TORRY
Vice President
Thermotank, Inc.
Detroit, Mich.

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Now, even when the lighting is inadequate and the personnel inexperienced the various types of Revere Color-Coded Copper Water Tube can be identified in a twinkling. In addition it will simplify taking of inventory, checking bills of lading and shipping tickets and double-checking against building specifications.

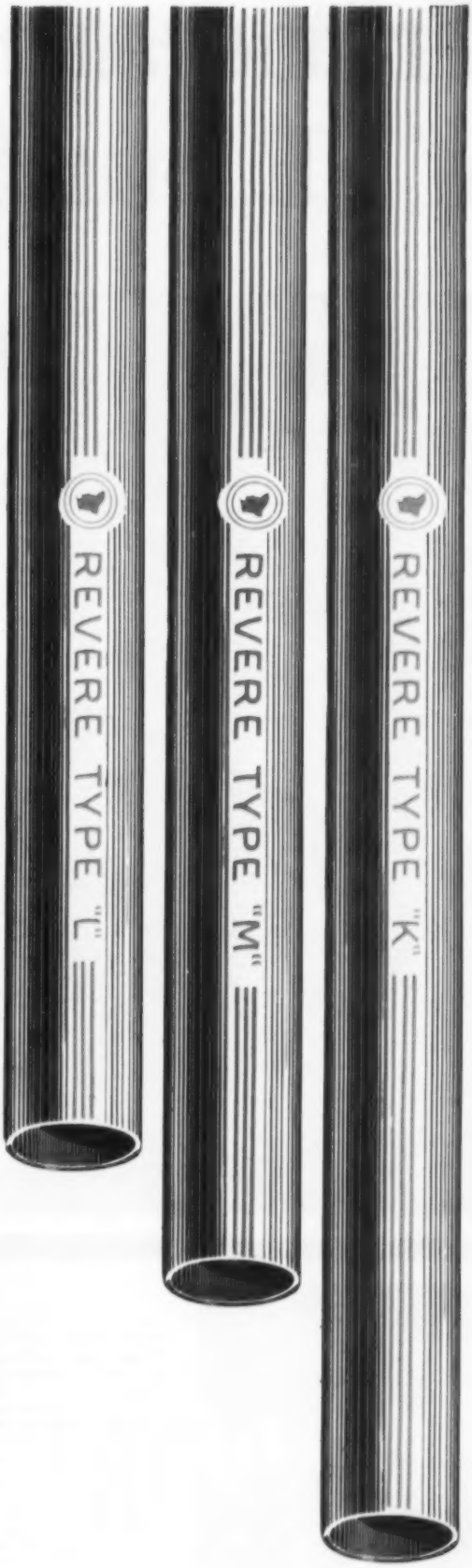
Markings shown at right, run the full length of the 20-foot tubes, and are spaced about every 12 inches. In addition to the 3 shown, Type DWV will be color-coded yellow and Type TP will be gray.

Inks used will remain fast while tube is being handled but will not interfere with soldering when normal cleaning procedures are used.

These color-coded markings are in addition to the present incised marking appearing every 18 inches as required by ASTM.

Cartons in which coiled Revere Copper Water Tube is shipped are also being stamped with the new color coding identifications.

For a top quality water tube that's more convenient to use make sure you specify "REVERE!"



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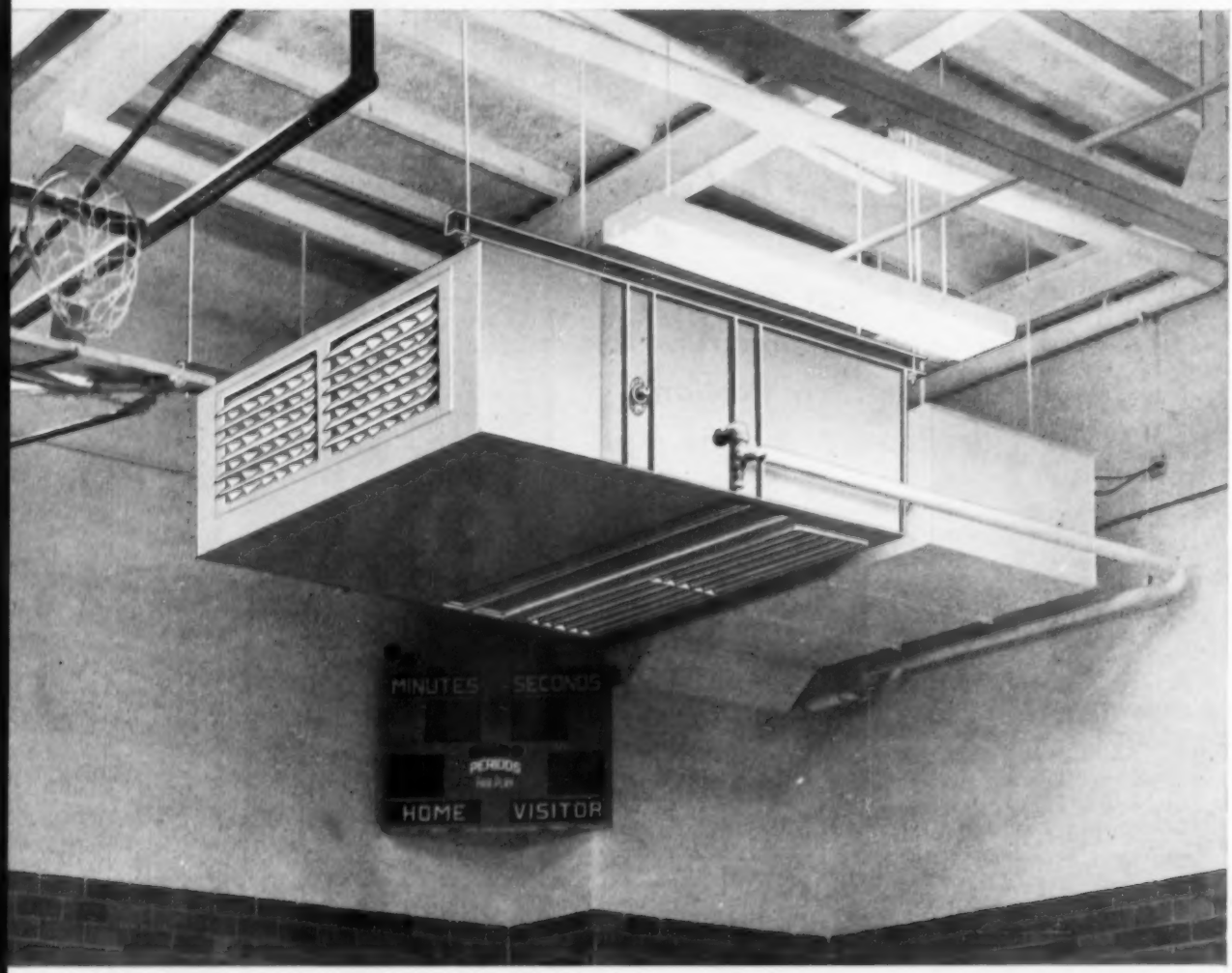
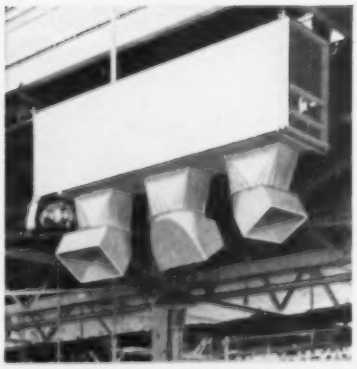
Trane announces the of all purpose heating-



HEAT AND VENTILATE locker rooms, gymnasiums and pools. Torrivent provides a compact unit for any hard-to-heat area—and provides necessary ventilation, too. Torrivents are economical—are turned on only when the space is being used. TRANE high efficiency Fans and Coils assure fast warm-up, maximum velocity. All fans and coils used in the Torrivent are manufactured by TRANE.



HEAT AND VENTILATE large industrial areas. Torrivent delivers a large volume of air heated to uniform temperatures, at uniform velocities. Air stream travels long distances before diffusing or mixing completely with surrounding air. May be used with duct work to heat and ventilate separate rooms or areas. TRANE Torrivents are also ideal for all kinds of industrial process drying and curing applications.

Torrivent...a new line ventilating units...

Now! For every institutional, commercial and industrial job, whisper-quiet, de luxe centrifugal units

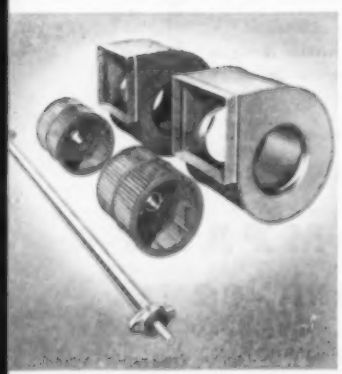
Here's the newest, most versatile heating-ventilating unit in the complete TRANE line! It's the TRANE Torrivent . . . designed to furnish large capacity heating—*and ventilating*—for all types of commercial, institutional and industrial buildings.

The Torrivent handles up to 33,000 cfm of air at low outlet velocities, with low horsepower requirements. And there's a complete range of sizes and models to fit any heating-ventilating job. Use the new Torrivent with or without ducts; install it on the floor, ceiling or wall—anywhere you need a powerful, dependable supply of warm, filtered, humidified and tempered air for heating, ventilating or process.

Ask your nearby TRANE Sales Office for complete facts on the new Torrivent. Or write TRANE, La Crosse, Wis.

CHECK THESE TORRIVENT FEATURES:

- **QUIETER OPERATION**—New, high-efficiency TRANE Fans have low outlet velocities for smooth, quiet operation.
- **MORE VERSATILE**—Torrivent units heat, filter, clean any combination of recirculated and outside air to meet heating-ventilating requirements for commercial, institutional and industrial buildings of every size and type. Also provide an economical, efficient source of heat for process drying, curing and other industrial applications. May be installed with or without duct work on floor, wall or ceiling. Swivel nozzles permit an infinite number of discharge directions.
- **MORE FLEXIBLE**—Complete range of coil types and sizes plus wide choice of filter box, mixing box, plenum and nozzle combinations to meet *every* heating-ventilating need.
- **WIDER RANGE**—Nine sizes—1, 2 or 3 fan models—from 1,250 to 33,000 cfm. Floor, ceiling or wall hung types.
- **LONGER LIFE**—Casing is of uniframe construction, with heavy gauge phosphatized steel. Fan shafts are solid (not hollow), large diameter for minimum vibration. Fan bearings are mounted *externally* for easy maintenance.
- **LOWER COST**—Greater coil and fan efficiency and multiple coil choice permit selection of equipment that meets requirements *exactly*. No wasted capacity! Highly improved production methods and basic design provide low cost de luxe equipment for any application.



FAN ASSEMBLY. Torrivents feature the latest and finest in a centrifugal forward curved fan—the new TRANE Model 31—for reduced outlet velocities, quiet operation. Close tolerances and refinement of blade curvature and design provide lower speeds for equivalent performance. Oversized, balanced, *solid* fan shafts, self-aligning bearings, lock-seam fan housings make for rugged dependability.

For heating, cooling, ventilating... For any air condition, turn to

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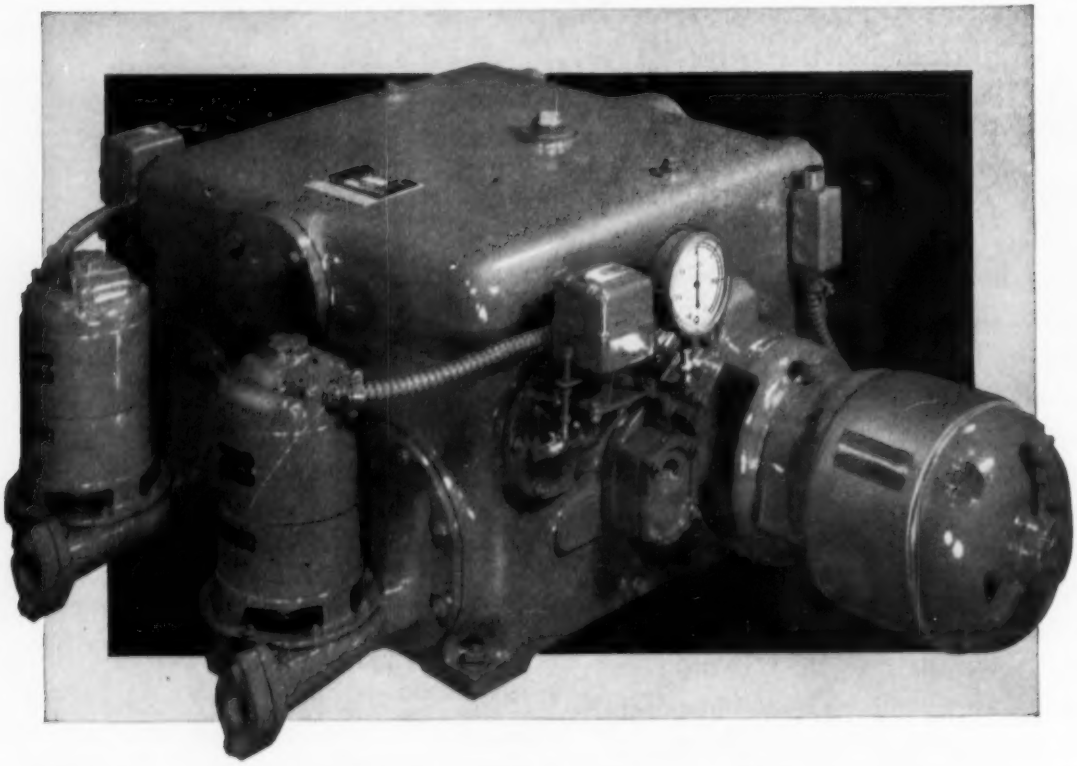
THIS NEW VACUUM HEATING PUMP

HAS THE INCREASED AIR CAPACITY EFFICIENT HEATING PRACTICE DEMANDS



It's the Nash CSM

Designed and manufactured by the organization that made the Jennings Manifold Heating Pump standard of the Heating Industry, the new CSM incorporates every desirable feature architects, engineers, owners and operators have sought. Employing separate air and water pump elements, each with its own motor and each independently controlled by its own automatic switch, the capacities and arrangement may be widely varied to meet job conditions. For the first time, the engineer has the choice of realistic water and air capacities required for rapid system response without wasteful overheating.

These pumps possess many other features which permit a more efficient utilization of fuel and minimum use of electric power. Low, low returns reduce installation costs and usually eliminate putting the pump in a pit. Simplicity and efficient operation reduce supervision and maintenance costs. Information regarding this new heating pump development is available immediately upon request.

- Increased air capacity induces rapid system response without wasteful overheating.
- Separate air and water pumps individually selected to meet actual job requirements.
- Control system that operates individual pumps only when needed.
- Flexibility permitting addition of radiation without changing basic pump installation.
- Low, low, return line connection.

NASH ENGINEERING COMPANY
437 WILSON, SO. NORWALK, CONN.

FORD EXPANSION PROGRAM, including recent developments at the huge Rouge plant in Dearborn, Mich., and current construction of new plants across the U.S., required the company to . . .

Set New Standards for Industrial Ventilation and Heating

THE HISTORY of heating and ventilating the Ford plants and offices over the years is an interesting record which illustrates the noteworthy progress that has been made in industrial ventilation in the last 50 years. The developments and changes that have taken place have repeatedly set a notable pace in establishing new standards for comfort and productive environment. Now in the era of a large scale company expansion program, improved environment standards are again being attained by the latest and most practicable methods.

Most Ford plants built prior to 1930 were one story structures designed with direct radiation heating systems: hot water circulated through cast iron wall radiation on the exterior walls and through pipe coils under roof monitors and monitor sash. The only provision for ventilation was the continuous ventilating sash in side walls and in high roof monitors. These features far exceeded the usual design standards of the period, and the results — in comfort to building occupants — were considered to be excellent.

Early Methods Outmoded

In the more recently designed plants the following new conditions dictated that former heating and ventilating methods be revised:

a) Increase in width of plant buildings which prevented the air, entering through side wall windows, from being effective as ventilation in the central areas.

b) Increase in amount of industrial exhaust from parts washers, paint spray booths, dust and fume control systems, etc.

c) Increase in power input per square foot of floor area for machining operations.

The combined effect of these changing conditions was to bring the realization that satisfactory results could be obtained only by employing positive controlled delivery of correct volumes of outdoor air and the positive controlled exhaust of hot or contaminated air from selected locations.

In the 1930's and 1940's air distribution that was considered satisfactory was provided by delivery of ventilating air through diffusers or directional grilles at the elevation of the bottom chord of the roof trusses. The air was supplied in some plants by fan-and-heating-coil units and in

POWERED ROOF VENTILATORS, as shown at the new San Jose, Calif., assembly plant, exhaust hot air in summer. Total capacity of ventilators equals the difference between the total desired summer supply and the process exhaust to maintain the desired balance

others by central fan stations and duct distribution systems.

This method of air delivery became unsatisfactory with the more recent practice of still higher concentration of power per unit area and increased heat liberation from other services. High level discharge of outdoor air tended to entrain the rising hot air so that relief from heat was obtained only by dilution. To get acceptable results, unreasonably large quantities of ventilation air were required.

Now Deliver Air at 10 ft

In the most recently designed plants, full benefit from the ventilating air is obtained by locating the air discharge openings at approximately 10 ft above the floor in sheet metal casings surrounding the building columns. Each of the discharge openings is a sheet metal cylinder through which there is a slot fitted with adjustable directional vanes for controlling air discharge direction in a vertical plane. This cylinder is mounted in a gasketted frame which permits the cylinder to be rotated through a moderate horizontal angle. Thus the direction of air discharge may be adjusted in both horizontal and vertical planes to avoid impingement on obstructions.

The principle of operation is to deliver the ventilating air at high velocity — 2500 to 3000 fpm — just above the breathing zone in such directions that interference to distribution by machine tools, ovens, etc. will be avoided and a maximum of low level aspiration will result. This arrangement will permit outdoor air to be delivered into a stratum below the rising warmer air and will create a desirable air motion in the "breathing zone" without direct impingement upon operators. The picture on the next page, taken during the later stages of machinery installation in one plant, illustrates the adaptability of the adjustable outlets.

Supply 2 Cfm of Air Per Sq Ft

The amount of outdoor air supplied to any plant in summer is selected to suit the requirements peculiar to that plant. The objective is to produce an average working environment with an effective temperature not objectionably above that outside. Two cfm per sq ft of floor area is a commonly selected amount. In winter, the combined capacity of all tempered air supply equipment is designed to exceed, by a reasonable percentage, the total of all process exhausts.

Powered roof ventilators, operating at conservative speeds for safety and to minimize noise, exhaust hot air in summer from the stratum under the roof. The combined capacity of these roof ventilators is equal to the difference between the total desired summer supply and the process exhaust. The intent is to keep the supply and total exhaust in substantial balance at all times.

Special treatment of air supply and exhaust is given to areas in which furnaces and other high heat liberating equipment are installed. Liberal controlled supply and natural draft exhaust gives desired results under certain conditions.

The warehouse areas of parts depots and some other plants which have no requirement for steam for process use, have been heated and ventilated by direct-fired space heaters using oil or gas for fuel. These installations are quite conventional except that special features are specified to conform to the high Ford requirements for safety.

Several notable exceptions to the foregoing general history of heating and ventilation in Ford plants deserve description.

Hollow Columns Used in 1908

Back in 1908 when a six story manufacturing building was erected at the Highland Park, Mich., plant, a heating and ventilating system which was unique was developed. Fan stations were located on the roof. Air was drawn over cast iron heat transfer surfaces and discharged by the fans through heavily insulated ducts on the roof to downcomers in the hollow concrete building columns. In the columns, outlet grilles about 8 ft above each floor gave very uniform air distribution. The air quantity sup-

AIR DELIVERY in newest plants is about 10 ft above floor from multiple discharge openings surrounding building columns. Direction of air discharge is adjustable horizontally and vertically to avoid impingement on obstructions

plied was small compared with present practice but, since the ventilating requirements were much less, the results were good, even exceptional in 1908.

In 1922 when the manufacturing operations of the company were being transferred to the Rouge plant, the Production Foundry, now called the Dearborn Iron Foundry, was built. Approximately 600 ft wide by 1200 ft long, it was then reputed to be the largest building under one roof ever built for manufacturing purposes. This foundry was probably the first in the world to make use of so-called mass production methods.

The advanced foundry methods required ventilation of a type radically different from that regularly in use in the foundries of 1922. Nine fan stations, each housing two 55,000 cfm fans, were in alternate roof monitors which were A-shaped, 22 ft wide and 36 ft high, with continuous ventilating sash on both sides. Each fan drew its air from a tall intake stack, through cast iron heating surfaces, then through an air washer, then through reheat sections. Hot water was circulated through the sections to supply heat as required. This system delivered approximately 1 million cfm of washed outdoor air through ducts and downcomers which discharged it into the breathing zone. This caused the heat and smoke from foundry operations to be floated up and out through the monitor sash. In its day, this system was most successful.

Control Foundry Fumes, Dust

The change from simple Model "T" castings to the intricate "V-8" castings and the casting of "V-8" crank shafts in core sand molds enormously increased the core ovens and congested all operations in the foundry. Fume and dust problems in the building were multiplied.

By 1948 the heating sections had become so fouled with accumulated dirt that air flow was badly restricted. Since the dust collecting and smoke removal systems were attempting to exhaust nearly 3 million cfm, ventilation was completely out of balance.

Thereupon, the cast iron sections — weighing several hundred tons — were removed and replaced by modern copper tube and copper fin heating coils using steam as the heating medium. Several fan stations were added and "compensating air" supplied to dust control hoods and smoke control enclosures. With the building in substantial balance between supply and exhaust air and with modern effective dust and fume control and dust collection, the atmosphere both inside and outside the foundry has no resemblance to the very unsatisfactory conditions of 10 years ago.

The newer Ford foundries have ventilating system designs that avoid the troubles which had to be corrected as described above. The total capacity of the air supply fan systems is determined by matching the total exhausting requirements.

6000 Ton System Controls Heat

The third notable exception to usual Ford ventilating systems is in the Dearborn Engine Plant at the Rouge. This two-floor manufacturing building was erected in 1940-41 for the manufacture of Pratt & Whitney R-2800 aircraft engines. The necessity to obtain close tolerance fits between metals having different coefficients of expansion required that the whole manufacturing space have controlled temperature.

Six 1000-ton refrigeration units were installed and chilled water was delivered to the 48 main fan stations in a total of 12 fan rooms around the periphery of the building. The air handling system was quite conventional with about 70 percent recirculation and with air diffusers approximately 18 ft above floor levels. When the building was converted to the manufacture of automobile engines, many new problems were encountered.

Dry machining of cast iron parts and greatly increased power input per unit of floor area called for dust collectors and hoods for the control of smoke and heat, each with its exhaust fan removing air from the building. Under these conditions recirculation and close temperature control is not possible. Instead, the system is operated to deliver 100 percent outside air, cooled and dehumidified as much as can be effected by the installed refrigeration, through downward directed diffusers only 10 ft above floor level. The result is that the average breathing zone temperature is held to approximately outdoor temperature, and moderate air motion is maintained.

Thus, in this two story, black-out type building, it has been possible to give operators as good operating conditions as in the more recently constructed, single story plants discussed above.

These examples from Ford's ventilating and heating experiences show how increasingly advanced methods are being applied — to provide greater comfort for employees and to improve quality of product. ≠

LABORATORY BUILDING contains two main test rooms, office, equipment room, and work spaces

Dedicate New Lab for Air Distribution Research

... as designers seek more information on outlet performance

By H. E. Straub

Research Engineer
Titus Mfg. Corp.

IN RECENT YEARS in the field of heating and air conditioning, much emphasis has been placed on the quality of the air distribution. Results of this emphasis has pointed up the importance of the supply outlets as a part of the heating and air conditioning system, and has caused the designers to seek more and more information on outlet performance.

In order to keep abreast of the advances in the field, manufacturers of air distribution products must be capable of supplying complete engineering information on the performance of present products. In addition, to keep ahead of the needs in the field and to advance the art, they must seek out and contribute to the fundamental information on air distribution.

To accomplish these aims, our company recently constructed and dedicated its new air distribution research laboratory.

Contains Two Test Rooms

The 60 × 40 ft laboratory building is of concrete block and slab construction with 14 ft walls and a peaked roof. The building contains two main test rooms, office, equipment room, and work spaces.

Test Room No. 1 might be considered a general purpose room and is the larger of the two test rooms, 35 × 23 × 13 ft. The walls and ceiling consist of 4 in. of mineral wool, with a 1 in. air space between the insulation and a peg board facing. The walls have a composition board backing.

The floor is made of plywood mounted on rigid insulation and 12 in. joists. The entire room rests on a separate slab and is independent of the enclosing building. Acoustically this construction results in a room constant of about 2700 at a frequency of 500 cps, and would be classified as a dead room.

Three ducts on each of the two long walls are arranged to supply warm or cool air into the space between the peg board and the insulation. By adjustment of dampers and air quantities, the air is introduced behind the peg board when warm air enters near the floor, and when cool air enters near the ceiling. Thus, extraneous stratification and cross currents are eliminated, and the sole function of this air is to absorb the load introduced through an outlet under study. Consequently, by thermostatic control of the supply air and room air temperatures, it is possible to maintain a constant temperature differential.

Thus, in Test Room No. 1, engi-

neering selection and performance data may be obtained for outlets handling either heated or cooled air. Specifically, this data would include sound level, throw, drop, rise, spread, and pressure requirements as related to the temperature differential, the supply air velocity, and air flow rate for each type of outlet. Additional information may be obtained for certain outlets, such as the mounting or ceiling height, and fundamental information on heating and cooling jets.

Test room No. 2, 23 × 5 × 8 ft, has walls and ceilings of ½ in. plasterboard and a floor of ½ in. plywood, and has a crawl space under it and an attic space above it. Corridors along two adjacent walls can be conditioned to simulate a wide variety of heating or cooling situations. For example, a corridor temperature of about 50 F results in an inside surface temperature on the wallboard which might be compared to that which would be obtained on the inside of a wall with a *U*-factor of 0.25 with an outdoor temperature of zero F. The other two walls of the room face the office and a 6 ft space between the two test rooms, which are conditioned to the same temperature as that maintained in the test room during a study.

Nearly 100 thermocouples are within and around the room to obtain the temperatures necessary for control of test conditions and air temperatures for the analysis of the resulting air distribution. Additional information on the characteristics of the air distribution may be obtained by special smoke procedures and by anemometer readings.

The wall facing the office contains two observation windows through which smoke studies may be observed. Acoustically this room has a constant of about 76 at a frequency of 500 cps, and would be considered a live room. All of the wall, floor, and ceiling panels are held in place by screws so that any panel may be easily removed to install an outlet in any location or to move a whole wall and change the size of the room.

Thus in this room the following may be obtained:

a) The relative air distribution from any new development under simulated heating or cooling conditions of operation.

b) Information which shows the best method of applying the data obtained in Room No. 1 when the primary air is introduced in a confined space with warm or cool surfaces.

c) Basic information as to effects of outlet types, location, and operation under heating and cooling conditions.

Air Condition Three Zones

Three air delivery systems, which contain a water coil and blower, are employed as follows:

System No. 1 is used to air condition the office, the space between the two test rooms, and to load the walls in Test Room No. 1. The quantity of air introduced into each space is controlled by a series of dampers, and the temperature of the air is controlled by a thermostat located either in the office or in Test Room No. 1.

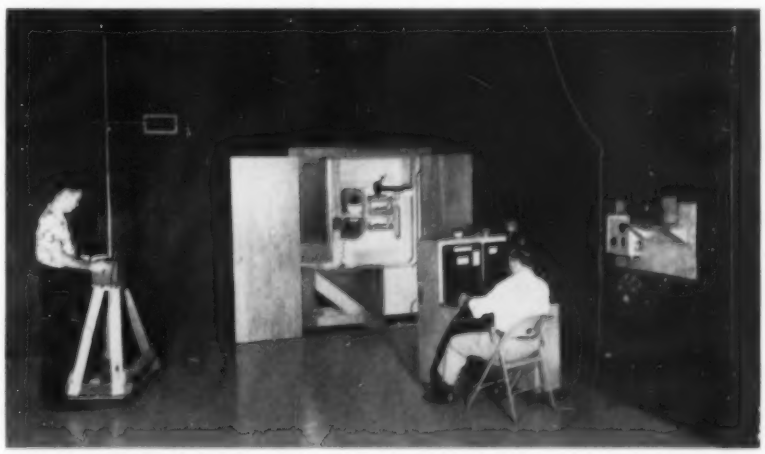
System No. 2 is arranged to air condition the corridors of Test Room No. 2 and thus impose the heating or cooling load on this room. The temperature of the air leaving this coil is controlled by a thermostat in the corridors.

System No. 3 is utilized to condition the air which is supplied to the outlet under study. By means of a variable speed motor, the blower can deliver from 50 to 3000 cfm with supply air temperatures from 50 F to 180 F. An air flow measuring section on the inlet side of the blower is arranged to utilize one of three orifices — 4 in., 7 in., or 10 in. — depending upon the quantity of air to be measured. The approach to this measuring section can be connected to a return system from either of the two rooms or to a special wind tunnel. The wind tunnel was used for the initial calibration of the orifices and is also utilized to calibrate various anemometers.

Several permanent outlet locations are set up in each room, such as a ceiling outlet location in Test Room No. 1, which can be utilized for an outlet up to 5 × 2 ft. However, in general, the ductwork on the discharge side of the blower can be arranged to supply outlets in any location in either room.

The temperature of the air is controlled by a thermostat located in the ductwork or in either of the two rooms.

The major mechanical equipment is housed in a special room in the laboratory. It consists of a motor generator which delivers 5 hp to a variable speed direct current motor for variable fan speeds; a 195,000 Btu per hr hot water boiler; a 3 ton water chiller; circulating pumps to supply hot or chilled water to three special coils; and modulating valves



MAIN TEST ROOM, 35 × 23 × 13 ft, rests on separate slab independent of enclosing building. Walls and ceiling, faced with peg board, are of 4 in. thick mineral wool backed by composition board

TESTING DIFFUSER, engineer uses anemometer to measure velocity

which control the amount of water delivered to these coils in response to the demands of various thermostats.

Use Variety of Instruments

In addition to the facilities for testing and for controlling test conditions, considerable instrumentation is required to accurately measure the air flow rates, velocities, pressures, sound levels, and temperatures.

With the exception of the wet bulb temperatures, which are obtained with a psychrometer, all temperature indications are obtained from thermocouples. The electromotive force created in the thermocouple is indicated by an electronic potentiometer and then converted to temperature.

The majority of pressures encountered are only slightly above or below atmospheric pressure and are measured on inclined draft gages. A micromanometer is available for more precise measurements.

The pitot tube is used as the primary means of velocity and air flow measurement. Special micro dynamic probes are available for cases where the size of the pitot tube is prohibitive. In the case of the permanent measuring station, thin plate orifices calibrated by pitot and dynamic tube traverses are used to measure the air flow rate. In some cases, venturi sections are used for air flow measurements.

Commercial anemometers of the hot wire, rotating vane, and deflecting vane types are used for velocity measurements. In addition, heated thermocouple type anemometers are being developed for use in the laboratory.

Sound level data is obtained with a meter which meets the requirements set forth in the *American Standard for Sound Level Meters for the Measurement of Noise and Other Sounds* (Z24. 3-1944). ⫩

1000 Ton Remote Unit System Conditions Koppers Building

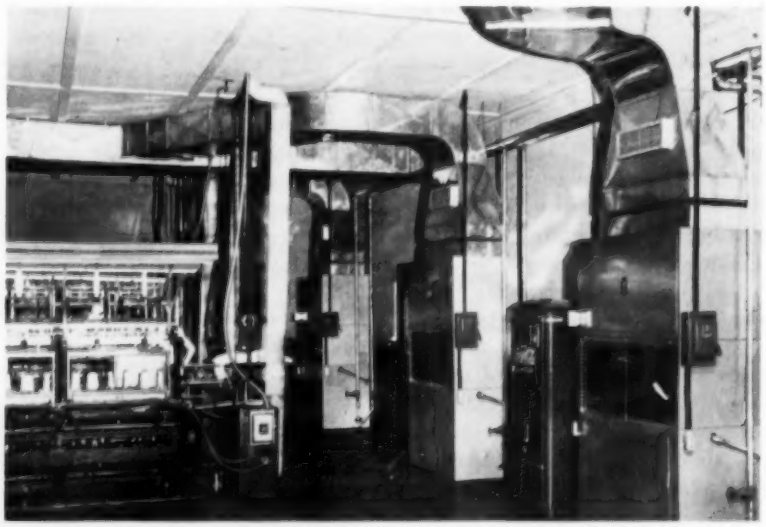
THE LARGEST air conditioning system ever installed as a single project in an existing building in Pittsburgh will start operation this fall, according to the Carrier Corp. The 1000 ton system, utilizing two centrifugal refrigerating machines, is nearing completion in the 25 year old Koppers' building.

Radiators and existing window sills are being replaced by 1400 room units, to which conditioned air will be distributed at high velocity through small ducts.

Conditioned air is to be supplied from three central stations, two on the 10th floor and another on the 21st. Chilled and warm water circulated to coils in the individual room units will permit occupants to select the temperature they desire.

The building is owned by the Equitable Life Assurance Society of the United States. It was purchased from Koppers Co., Inc., in 1948.

The consulting engineer is Peter A. Loftus Co. ⫩



60 Ton Package System Cools, Heats Hosiery Plant

. . . cuts maintenance, increases production

AIR CONDITIONING cut maintenance costs 80 percent after four 15 ton water cooled package units were installed in the John Hardy & Son, Inc., nylon hosiery plant in Pulaski, Tenn. In addition, President Hardy reports a 29 percent increase in production, according to the Airtemp Div. of Chrysler Corp.

Ducts from the four units merge into two main supply ducts that extend the length of the factory. The same ductwork that is used for cooling is also used for heating. Two of the air conditioners — one on each duct system — are controlled by both a thermostat and a humidistat to permit removal of moisture during inbetween seasons. Reheat is used to control temperature under these conditions.

Moisture is added in winter from a spray type humidifier plus atomizing nozzles. ⫩

Sam Lewis' Page

Pipe Fitting Apprentices' Skills Show Degree of Bosses' Interest

FOR SEVERAL YEARS I have been one of the judges of the quality of workmanship and skills evidenced by apprentices of the United Association of Journeymen and Apprentices of the Plumbing and Pipe Fitting Industry.

This forward looking trade union cooperates in a remarkably generous manner with the employers national organizations to improve the quality of the service given by each rising generation of the men who do the work.

One cannot help being inspired by the appearance and interest shown by these apprentices who, having been winners at home town or state competitions, appear annually at the Purdue university shops to continue their education. They come to demonstrate their ability eventually to become proprietors of their own contracting businesses.

The young men, due to cooperation between their unions, their employers, Purdue and other universities, and several progressive industries, are brought into contact with such collateral matters as influence of atmospheric pressure, principles of refrigeration, hydraulics, steam boilers and piping, electric and pneumatic automatic controls, sewage treatment, and interpretation of governing codes.

There is evidence each year also, of improvement in the mental capacity of the apprentices in orderliness of their approach to a manual task, and in the diligence with which they perform it.

Each man is furnished with a work bench and with the best quality of service tools such as those for cutting, welding, and soldering.

It is interesting to observe the differences in quality of output and the time intervals between competitors who employ benches and vises and power tools and those who use the concrete floor.

Some apprentices come with their own jigs and clamps and micrometers, while others borrow brick bats and pieces of wood to support the work.

Apparently these differences in technique are the result of interest, or lack of it, by the journeymen who bossed the apprentice.

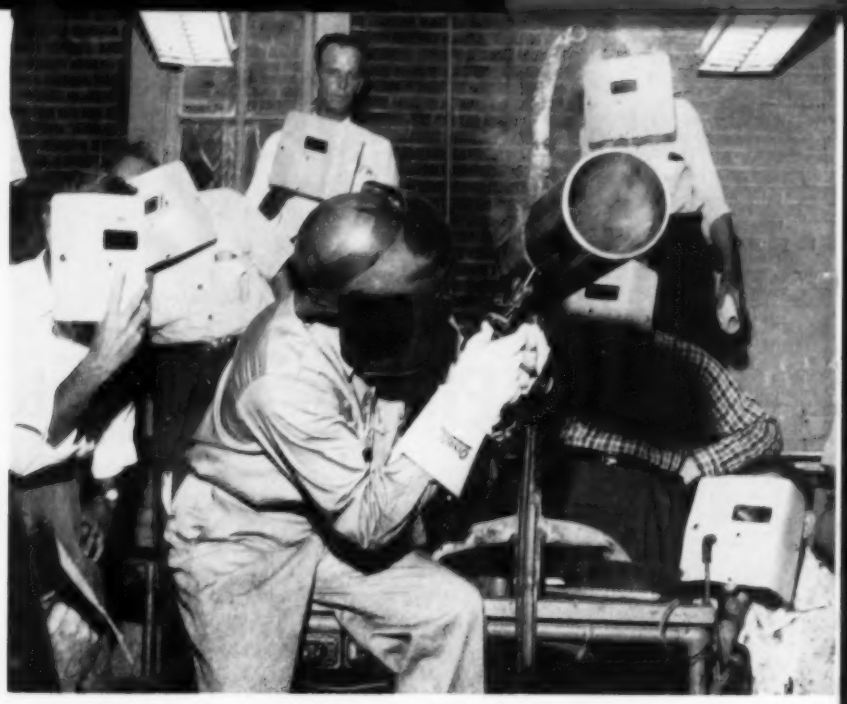
I remember one fine old steam fitter journeyman who called his helper his "stenographer" but who had educated his apprentice to act after the manner of the surgeon's assistant, to foresee the need for the next instrument or appliance in advance and to deliver it instantly.

This journeyman gave his "stenographer" many opportunities to employ brains as well as powerful muscles and would talk things over with his apprentice as a friend rather than merely as a tolerated servant.

I find in my own engineering business, myself, as an alleged journeyman due to experience, the benefit of consulting with and gaining the viewpoint of my own apprentices. ⊣

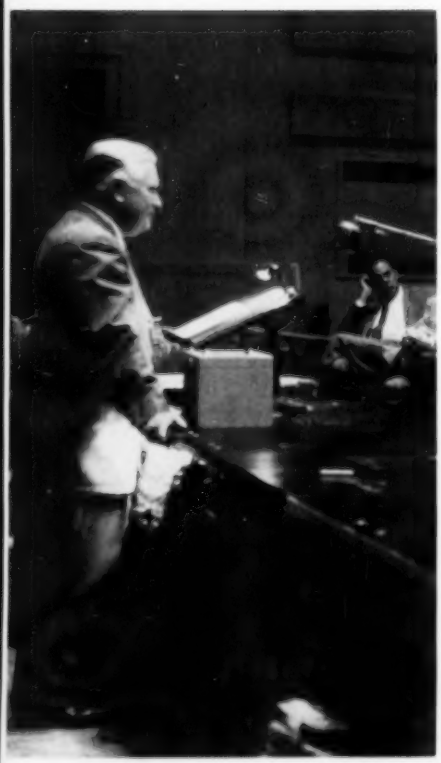
SAMUEL R. LEWIS, consulting mechanical engineer and a member of HPAC's board of consulting and contributing editors, comments informally each month on practical heating, piping and air conditioning problems.

SKILLS DEMONSTRATED by Robert A. Patterson, of Pittsburgh, top among pipe fitting apprentices in international contest at Purdue university, were developed in five years' training on the job and in school



WELDING DEMONSTRATION given UA instructors was one of several methods sessions in training course. Instructors were given help in presenting training materials and methods at local level

Pipe Fitting Apprentices and



MAIN SPEAKER at the third annual international apprentice contest at Purdue university was W. L. Cisler, president and director of The Detroit Edison Co.

. . . in expanding training program of the United Association of Journeymen and Apprentices of the Plumbing and Pipe Fitting Industry of the U. S. and Canada

THE NEED for upgraded skills in the mechanical (heating, piping, and air conditioning) contracting field continues to grow with each new step of economic and industrial progress. This fact is of urgent concern not only to the contractors responsible for installing these systems but also to the engineers who design them, to the manufacturers supplying materials and equipment, and to building and plant owners, managers, and operating and maintenance engineers as well. For all, the importance of well organized and conducted training of apprentices by competent instructors cannot be overemphasized.

It is a job whose significance is receiving increasing recognition in several quarters. One evidence is the apprentice contest and instructor training program of the United Association of Journeymen and Apprentices of the Plumbing and Pipe Fitting Industry of the U.S. and Canada, under Joseph P. Corcoran, director of the UA's training department. Now in its fourth year, the program is a great step forward. It is sponsored also by the Mechanical (heating, piping, and air conditioning) Contractors Association of America and by manufacturers in the industry who contribute equipment for use in the contest and courses.

Speaking for his association, George Hall, president of the MCAA, told the UA convention in Kansas City recently, "The first responsibility which I recognize is one of trained personnel. Last week I attended at Purdue university the very interesting and valuable apprenticeship contest which you have sponsored there and which we most warmly support.

ATMOSPHERIC PRESSURE, subject of this methods session, was taught by Prof. C. E. Highlen, right, of Purdue. Small classes permitted members to exchange instructional methods and ideas

Instructors Increase Skills

"The boys who competed at Purdue represent the delegates at this convention five or 10 years from now, and a good many of them will sit in employer conventions in the years ahead. So a union card is not enough. Every union man has the responsibility to continue his training throughout his working life."

Looking to the future, Mr. Hall referred again to the apprentice program. "Our apprenticeship program is in good hands, and with continued vigorous support it will produce mechanics and supervisors who can handle the pipe work of the future."

The annual international apprentice contest and instructors' conference is likewise drawing words of praise from members of local apprentice committees, contestants, and instructors.

D. Bart Phipps, secretary of the Texas State Joint Apprentice Committee, believes that the training department of the UA is one of the most important ever organized in the UA. "It is definitely paying dividends," he says. He calls attention to the "magnificent job" the depart-

PLAQUE commemorating winning of first place award in pipe fitting went to Local Union No. 449, Pittsburgh

APPRENTICE WINNERS of first, second and third place cash prizes of $1000, $500, and $250 are, left to right; Robert A. Patterson, Pittsburgh; Harold E. Kindt, Milwaukee; and Jerry N. Ahik, Atlanta. Their local unions received similar plaques

ment is doing in presenting the instruction material on a national level and in assisting in the use of it in the local apprentice programs. In his opinion, "there is nothing more important than apprentice training."

Instructors Charles L. Malchert and Edward Zeller, both on the staff of a new $200,000 apprentice training school in New Orleans — a private school built by educational and welfare funds of Local Union 60 and employers' association contributions — were impressed with the thoroughness in which the whole program was planned by UA officials and the industrial education department of Purdue university.

"A wonderful feature of the program," the two instructors felt, was "the opportunity to meet with other instructors from all parts of the U.S. and Canada and swap ideas, methods, techniques, and problems at the local level."

The 200 other instructors, whose enthusiastic attendance and participation was marked at all the sessions, hope that the training courses will be continued and expanded because they believe "the courses will bring about an ever increasing improvement in the UA apprentice program." The training course has given the instructors, they say, a feeling of confidence that comes from knowing that they are provided with a well organized program and that they have the backing of the UA in their efforts to do a better job of teaching. Through the course, they are "endeavoring to obtain a common goal, that of fully qualified, competent instructors."

What do apprentices feel about the contest? Here is what first prize winner Robert A. Patterson, Jr., of Pittsburgh, wrote to the UA's general president, Peter T. Schoemann:

"Being the proud possessor of the first place award for the 1956 Pipe Fitting Apprenticeship Contest, I send this letter of thanks to you with a heartfelt 'Thank You' to our entire United Association for making this contest possible. It has been for me, as it must have been for many apprentices, an incentive for learning more about our trade.

"My five years as an apprentice on the job and in school have left me with the feeling that I can now go out and do a good job as a journeyman pipe fitter.

"I am very grateful and honored at having been presented with this award." ⧺

Factory Air Conditioning for Worker Comfort Is Definite Trend

. . . national survey discloses

A NEW KIND of industrial revolution is marching across the country, involving air conditioning of U.S. factories, says D. C. Minard, president of The Trane Co. A nationwide survey just completed by his firm notes a definite trend toward air conditioning of U. S. factories for employee comfort and efficiency, he reports. This was distinguished from air conditioning for climatic control necessary for many industrial processes.

In the survey, leading architects and consulting engineers were interviewed by a cross section of the company's 90 sales offices across the nation.

Trend Follows Construction

Noting that contract awards for U. S. industrial construction in the first half of this year were up 29 percent over corresponding figures for 1955, Mr. Minard explains:

"Leading architects and engineers tell us that industrial air conditioning for employee comfort is developing faster than anyone thought it would. It seems fair to say that the economy of the country is entering a new kind of expansion. This is a stage of building not only for increased capacity but for modern industrial environment which will cut production costs."

The trend toward factory air conditioning is rapid especially in the South, where some consulting engineers have estimated that as many as 75 percent of new factories — and 50 percent of all factories — will be air conditioned for employee comfort by 1960, and 90 percent by 1970.

But the trend is spreading also to the North, particularly in factories involving high skills.

Factors in the trend include competition for skilled help, the desire to maintain employee efficiency in hot weather, and pressure by labor unions.

"While the spread of factory air conditioning is helped by good economic conditions," Mr. Minard says, "the trend wouldn't necessarily slacken in the event of business slow down. Manufacturers then install as many cost saving devices as possible in order to keep their products profitable even at highly competitive prices."

In many instances, it was found, consulting engineers are recommending that new factory buildings be constructed with air conditioning or built to allow easy installation of air conditioning in the future.

Area Forecasts Given

One of the questions asked in the survey was: "What proportion of U. S. factories do you estimate will be air conditioned for comfort by 1960? 1970? 1980? Please split your predictions between new construction and the addition of air conditioning to existing buildings."

Representative answers are as follows, as reported by various offices after checking with leading consulting engineers and architects (answers were based on their own areas):

Dallas: 1960 — 75 percent of new factory buildings to be air conditioned for employee comfort, 50 percent of existing buildings; 1970 — 90 percent in both categories; 1980 — above 95 percent in both categories.

Houston: 1960 — 50 to 75 percent in both categories; all present facilities not abandoned by 1970 to be air conditioned.

Detroit: 1960 — 7 percent of new factories, 3 percent of existing factories to be air conditioned; 1970 — 21 and 9 percent, respectively; 1980 — 60 and 30 percent, respectively.

St. Louis: 1970 — 25 and 10 percent; 1980 — 70 and 20 percent.

Cleveland: 1960 — 7 and 4 percent; 1970 — 20 and 15 percent; 1980 — 35 and 25 percent; for both new and existing factories making precision and technical equipment: 1960 — 25 percent, 1970 — 40 percent, 1980 — 75 percent.

New Orleans: 1960 — 50 percent in both categories; 1970 — 75 percent in both; 1980 — 100 percent in both.

Atlanta: 1960 — 40 and 10 percent; 1970 — 80 and 50 percent; 1980 — 95 and 80 percent.

San Francisco, where low summer and mild winter temperature was listed as a factor: 1960 — 3 and 6 percent; 1970 — 12 and 20 percent; 1980 — 25 and 30 percent.

Chicago: 3 percent by 1960, 15 percent by 1970, 35 percent by 1980, 90 percent of those figures in new construction.

Other Highlights

Consultants in the textile field estimated that 20 percent of floor space is air conditioned with refrigeration today as against 1 percent 10 years ago. This is exclusive of spaces using evaporative cooling, and total floor space of course includes such areas as warehouses as well as production space.

Almost complete air conditioning of textile and tobacco manufacturing areas will be finished by major manufacturers by 1970 and by smaller firms probably by 1980. Very little new construction in either industry will go up by 1960 which is not fully air conditioned, it was reported.

Other survey highlights from the report:

Dallas — Consulting engineer Sam Sirman: "Public demands and union demands will pressure building owners to provide air conditioned spaces."

Philadelphia — P. L. Davidson, consultant who has offices there and in Greensboro, N. C.: "Unions are very active in the program in the textile industry and are insisting on an 80 F effective temperature; in the textile field it is hard to divorce comfort cooling from process cooling but the comfort requirement is becoming an important factor."

Houston — Bernard Johnson, of Bernard Johnson and Associates: "Air conditioning of factories in this area has not been purely for employee comfort but for the increased production obtained. . . In the Houston area, air conditioning is as much a part of life as heating is in the colder areas. It has been a long time since we have designed a heating system for the future addition of cooling."

Also Houston — Dale S. Cooper, of Dale S. Cooper and Associates: "The air conditioning of factories in this area is primarily for increased production and efficiency which results in profits to the owner. The fact that conditions for employee comfort are maintained is coincidental."

Boston — Ambrose Burton, vice-president in charge of construction, Cabot, Cabot, and Forbes, industrial developers: "There is a trend toward air conditioning of factories for employee comfort, especially in research and development work. Present acute shortage of good help, scientific and skilled, makes those industries include air conditioning for employee comfort. The trend is fast in this field, slow in other industries. Air conditioning of office areas is recommended to clients as a must."

Detroit — Griffels and Vallet, architects and engineers, have been retained for a number of industrial installations including a machine shop conditioned for employee comfort and Bendix Aviation installations in Detroit and Baltimore making radar, radio, and computing devices.

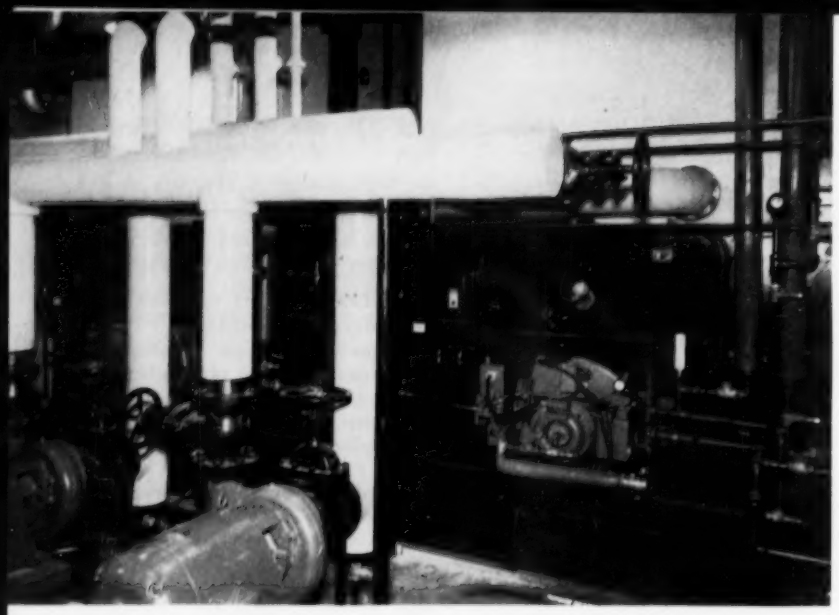
St. Louis — Air conditioning produces more efficient production. Experimental rooms, tool rooms, and final assembly areas, according to interviews, will be first to receive air conditioning. Unions are constantly asking for better working conditions, and consensus is that air conditioning will be included in these demands.

New York — Basic reason for industrial air conditioning is competition for help. This requires air conditioning for offices and technical help. Air conditioning in manufacturing spaces solely for human comfort appears to be somewhat in the future. Most engineers bring up the subject of air conditioning in discussions with clients.

San Francisco — Trend is developing slowly because of low summer and mild winter temperature in industrial sections. Increase in tendency to arrange installations to provide for cooling later is very pronounced.

Los Angeles — Many air conditioned factories listed. Trend is snowballing as companies compete for personnel in critical labor market. Harold Cross, Union Bank vice-president, recommends to bank's customers that they consider air conditioning to cut down turnover in personnel. ✠

Ceiling Seattle's



HEATING PLANT consists of two low pressure firebox type water heaters, each 5,830,000 Btu per hr in capacity, two 400 gpm circulating pumps, and a two pipe, open tank, forced circulation system

SEATTLE'S newest large apartment building, The Baldwin, was recently completed at a cost of about $2½ million. It is high atop the First Hill at Ninth Ave. and University St., giving a sweeping view of the entire city. It is 22 stories high and has 194 spacious apartments of the bachelor, and one and two bedroom types. The four story garage can accommodate over 200 cars and has full service station facilities operated on a 24 hr basis.

Individual Room Control

The successful and economical operation of the panel heating systems of the Grosvenor House [See June 1950 HPAC, p. 75.] and two recently completed 14 story apartment house buildings in Ketchikan, Alaska, were responsible for the selection of this system of heating. In these installations it was found that zone control was unsatisfactory, as the temperatures had to be carried high enough to satisfy "them what comes from Texas." This was too high for others and resulted in much opening of windows and fuel waste.

Also it has been found that people living in panel heated buildings will usually set thermostats at 70 to 72 F during their first winter, 68 to 70 F during the second winter, and 66 to 68 F the third winter after they have become "acclimated" to panel heating. Also some tenants prefer warm living rooms and cool bedrooms, and vice versa.

Hence, it was decided to use a separate intermediate acting throttling room thermostat in each living room and in each bedroom. This increased the initial cost considerably but will pay for itself in fuel economy, to say nothing of "tenants' comfort."

Three Main Design Criteria

The heating system is on one zone vertically. Due to the low water pressure at the site, it was necessary to put the domestic hot and cold water systems on two zones. The low pressure zone extends through the seventh floor and the high pressure zone extending from the eighth through the 18th floor.

The intermediate pipe work was all kept within a space of 14 in. — two stair risers — thus obviating the usual belt course and intermediate pipe floor and permitting the construction of an additional floor within the legal building height limit.

The primary heating plant is a two pipe, open tank, forced circulation system, with two low pressure firebox type water heaters, each of 5,830,000 Btu per hr rating. Arranged for rear oil firing, the heaters are readily convertible to front stoker firing. There are two circulating pumps, each with a capacity of 400 gpm against a head of 35 ft.

The fuel oil storage tank has a capacity of 8500 gal permitting truck and trailer oil delivery, which saves 20c per bbl, or about ½c per gal in fuel costs. Four loops of 2 in. pipe are set in the lower section of the tank for heating the oil, with hot water supplied through a thermostatically controlled valve. This allows the use of bunker C fuel oils.

Fuel is the largest single item of expense in the operation of apartments. In the Seattle area — 4438 deg days per annum — it has been found that the annual fuel requirements for domestic hot water are somewhat greater than the annual fuel requirements for heating. Fuel economy, ease of operation, and minimum maintenance costs were the main criteria of the design for the mechanical equipment.

Circulate Water Continuously

The hot water generator for the upper zone has 1130 gal storage capacity, with a copper coil heating element having 200 sq ft of heating surface. The hot water generator for the lower zone has 865 gal storage capacity, with a copper coil heating element having 150 sq ft of heating surface. Both systems are designed for continuous circulation.

The cold water system in the lower zone is connected to the city water mains. The cold water for the upper zone has a pneumatic pressure tank of 4500 gal capacity, and two alternately operating water pumps each

Panels Heat and Cool Newest Apartment House

By Erwin L. Weber
Consulting Engineer

900 UNIVERSITY AVENUE, set on hill, is 22 stories high, including four story garage. Tenants have individual temperature control in living rooms and bedrooms

of 200 gpm capacity against a head of 160 ft with 15 hp motor, controlled to cut in at 98 psig and to cut out at 102 psig.

The interiors of the hot water generators, and the pneumatic pressure tank were thoroughly rust proofed with four coats of phenolic resin base chemicals, 0.014 in. thick.

Both cold water systems are arranged for continuous circulation, thus avoiding the "tepid" cold water often found in apartments.

Embed Coils in Ceiling Slabs

The "evironditioning system" has about 20 mi of ½ in. steel pipe coils embedded in the concrete ceiling slabs. These coils are set ⅛ in. above the form deck by being supported on "buffalo chips" on about 36 in. centers. This places the coils high enough to not show through the under side of the slab, and permits one skim coat of plaster on the ceiling, in place of the three coat work required if coils are set directly on the form deck.

The panel heating system water is heated to an absolute maximum temperature of 135 F by two converters, each containing 200 sq ft of copper heating surface, connected in multiple.

A 5 in. flow riser extends to the penthouse where it terminates in a large air chamber with air trap. A flow header in the penthouse has four valved branches to north, east, south and west distributing mains in the attic space feeding the various downfeed flow risers.

Controls Consider Sun, Wind

The return risers are connected to north, south, east and west return distributing mains on the basement ceiling which extend through valves to a 6 in. return header in the heating plant room, from which two pumps, each of 450 gpm capacity against a head of 50 ft, circulate the panel heating water back to the converters. An open expansion tank is provided in the penthouse. There are four expansion loops in each flow and return riser.

The south and west return mains are each provided with a diaphragm valve actuated by its respective solar compensator, which immediately shuts off the heat to its respective zone when the solar intensity reaches a predetermined level. These compensators are installed on the outside walls of the penthouse. All flow and return risers are in inside spaces, such as the piping shafts, etc., and are completely concealed.

A completely pneumatic temperature control system provides for thermostatic control of the two hot water tanks and the heating coil in the oil tank.

The diaphragm valve in the line to the converters is actuated through an insertion thermostat set at 135 F absolute maximum flow temperature, from an outdoor thermostat on the penthouse set for the following range:

Temperature	
Outdoor 62 F	Water 75 F
Outdoor 20 F	Water 125 F

An anemometer on the roof increases the water temperature ½ F for each mile of wind in excess of 15 mph.

Solar compensators shut off the heat on all south and all west exposures when the solar intensity reaches a predetermined level.

Clocks Control Pumps

All pumps are controlled by clocks to turn the various systems on and off at predetermined intervals.

A 1½ in. cold water line is provided from the high pressure cold water header to the 5 in. panel heating flow risers to permit the feeding of cold city water in the panel coils for summer cooling, of which very little is required in the Seattle area.

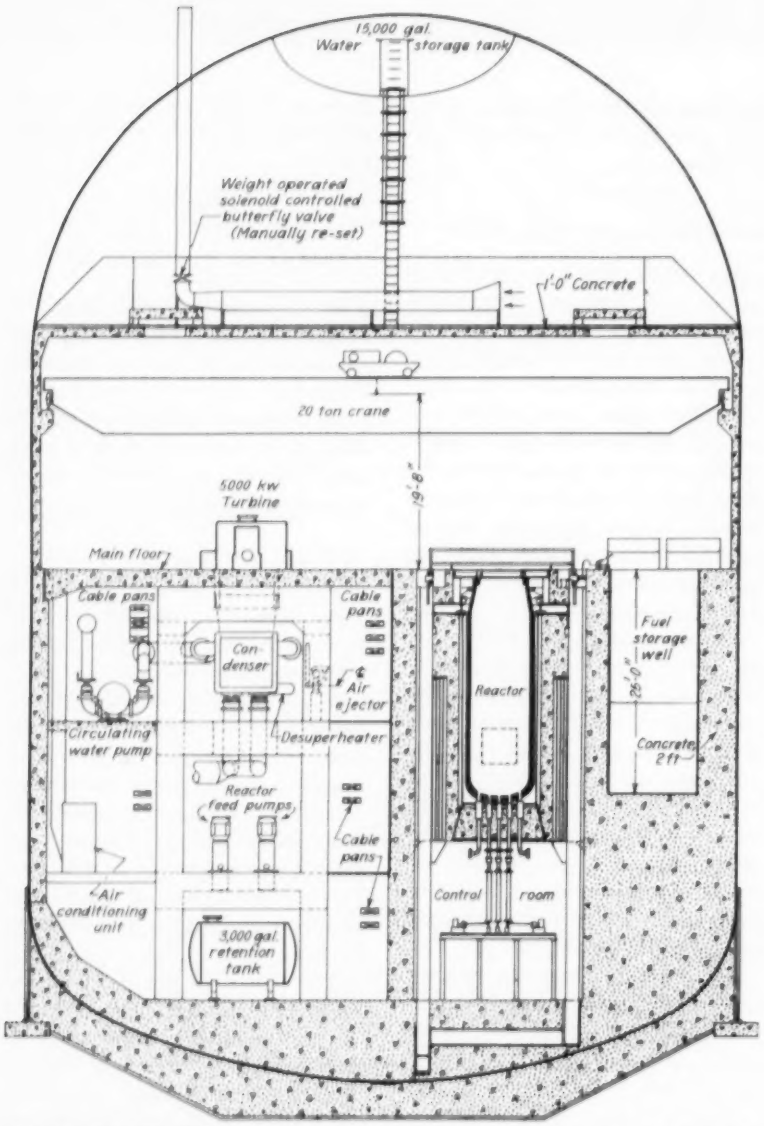
A complete system of exhaust ventilation is provided for all bathrooms, kitchens, etc.

The late Earl W. Morrison was the architect for the building. Donald N. McDonald and Associates were the supervising architects. Boyker Plumbing and Heating, Inc., were the mechanical (heating, piping, and air conditioning) contractors. ✻

Photos courtesy Kewanee-Ross Corp.

How Piping, Valves Serve

By Alf Kolflat
Senior Partner
Sargent & Lundy
Consulting Engineers



ATOMIC BOILER PLANT is housed in concrete clad steel cylinder 119 ft high and 80 ft in diameter. Main equipment, besides reactor, includes 15,000 gal water tank, *top*, steam separator, condenser, feedwater and circulating pumps, and turbogenerator. Note also atomic fuel storage well, *right*, and air conditioning unit, *left*

THE experimental boiling water reactor being built at the Argonne National Laboratory, 25 miles southwest of Chicago, is expected to begin producing electric power late this year. Its rated capacity is 5000 kw. It was developed by the Laboratory under the supervision of Dr. W. H. Zinn, director of the reactor program until his recent resignation to form his own engineering firm.

All the atomic features of the plant were developed by the Laboratory. The function of our firm was to translate these ideas into engineering design and specifications. The plant includes a service building with office space and control room, the reactor housing, and a cooling tower.

Reactor Cycle Is Simple

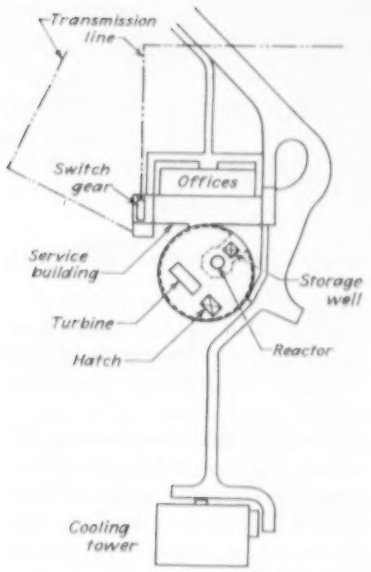
The boiling reactor cycle is simple in principle. The reactor, or boiler, consists of a cylindrical vessel 84 in. in diameter and 23 ft high in which the heat generated by the atomic core — approximately 4 ft in diameter — is converted directly into steam similar to an ordinary boiler.

The steam from the reactor first goes to a separator or dryer where excess moisture is separated and returned to the reactor, taking with it some of the minute radioactive material. The steam leaving the dryer goes directly to the turbine and condenser from where a combined condensate and feedwater pump brings it through filters back to the reactor shell. The plant is designed to operate with saturated steam at 600 psig. The activity of the reactor core is sensitive to steam pressure variation and in order to provide for some

This article is abstracted from a paper presented by the author at the 18th annual American Power Conference.

Atomic Boiler Plant

Familiar materials, though with some modifications, were specified for the piping systems installed in the $3½ million experimental boiling water reactor plant at the Argonne National Laboratory. All piping is welded. Special safety features were required because of plant's experimental nature.



REACTOR HOUSE is adjoined by service and office buildings. Induced draft cooling tower is set apart

variation in turbine load without a simultaneous change in reactor pressure and output, a steam bypass is provided. A normal adjusted bypass flow of 5 percent permits the turbine load to vary within this limit without affecting the output from the reactor.

No heat exchangers are employed, and some radioactivity will be carried over to the turbine and auxiliaries. However, it is expected that this activity will not be excessive nor long lived. Experience is available on this point from a similar smaller reactor already in service.

Steel Cylinder Houses Reactor

The building consists of a steel cylinder 80 ft in diameter and 119 ft high which contains the reactor, the turbine, the condenser, and the auxiliary equipment. The shell has a volume of about 400,000 cu ft and is designed for a maximum internal pressure of 15 psig so that in case the reactor shell should accidentally rupture, all the radioactive vapor formed from the heat in the water in the reactor will be contained inside this shell. Normally, the operators will not be inside the shell, as all operations can be directed from the control room. Access to the cylinder is through a large double door air lock with an emergency air lock that can also be used as quick exit.

The part of the shell which is underground is backed up by a heavy inside concrete wall approximately 2 ft thick, which braces the shell against the outside earth pressure. Originally it had been contemplated not to have any concrete on the inside of the upper part of the shell, but in view of the experimental nature of the installation and in order to provide protection for possible missiles in case of turbine or other failure, a concrete layer approximately 1 ft thick is provided on all sides as well as a suspended ceiling.

There is a 15,000 gal water storage tank on the top of the enclosure. This tank, in addition to supplying water for normal use, can also provide spray water in case of reactor failure and is open to the shell so that in case its pressure would increase, no additional head would be required for spray purposes.

Plant Is Air Conditioned

The plant will be cooled by mechanical refrigeration to avoid using large amounts of outside air. One-half air exchange per hr will be provided by a small fan, and the exhaust air will leave the plant through a duct which is designed for a 2 second holdup time before the air leaves the top of the shell.

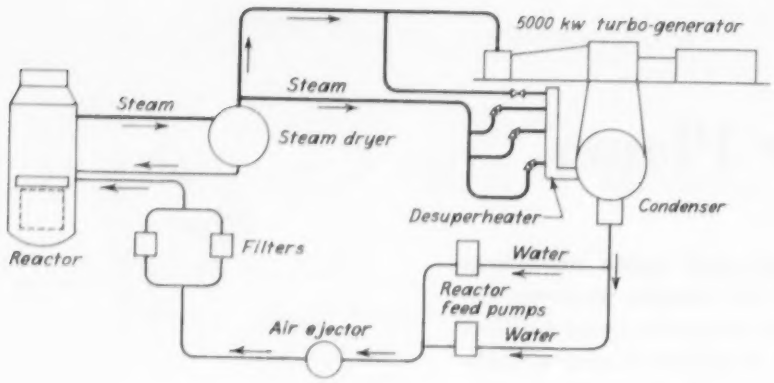
Quick closing butterfly valves are in the inlet and exhaust duct. Steam heating coils are provided in the air conditioning units. The control room will be air conditioned and the office, locker room, and laboratory will be heated by steam from the Argonne National Laboratory's heating system.

All Pipe Joints Are Welded

The reactor consists of a steel shell 7 ft in diameter and 23 ft high, 2⅜ in. thick with a 1 in. thick stainless steel shield inside and bolted top enclosure. The initial core — assembly of fuel elements — is 4 ft in diameter and 4 ft high, but can be increased to 5 ft. The total weight of the reactor is about 60 tons. Outside the reactor, there is a 3 in. lead sheath for shielding, plus 7½ ft to 8 ft of concrete on the side, and 3 in. lead on the bottom with 4 ft concrete. Pipe connections provide for forced circulation which may be added later.

After the steam leaves the reactor, it goes to the steam separator, which is a separate horizontal drum of stainless steel 3 ft in diameter, 8 ft long, and 1 5/16 in. thick. The separator is somewhat similar to the conventional type of corrugated plate scrubber used in steam boiler drums. The scrubber plates are also of stainless steel.

The steam leaving the reactor contains approximately 1 percent mois-



PIPING LAYOUT shown in this flow diagram of the reactor cycle emphasizes simple principle of the boiling water reactor

ture, which will be reduced to 0.1 percent, and the solids in the turbine steam will be in the order of 0.001 ppm. It is expected, therefore, that the amount of radioactivity carried over with the solids should be small.

When the reactor is shut down, some steam will continue to be generated by "decay" heat. Normally, this steam will be condensed in the main surface condenser, but the steam separator also contains a stainless steel cooling coil which can be used for emergency heat absorption during shutdown.

The turbine generator is a standard 5000 kw unit, designed for 3600 rpm. No vacuum breaker will be used as it is desirable to avoid room air from entering the working fluid system. Instead, the vacuum will be broken by bleeding in dry air from the recovery system.

Normal materials are used. The casing is carbon steel; shaft 1 percent chrome, ½ percent moly steel; buckets, diaphragm vanes, bands and nozzles 13 percent chrome steel; diaphragms cast iron; and wheels 1 percent chrome steel.

Consideration was given to blade erosion as the steam leaving the turbine will have 19 percent moisture as compared to 12 to 13 percent for a conventional design. On the other hand, the tip blade speed is only 760 ft per sec as compared to 1400 ft per sec for larger turbines. Cobalt occurring in stellite is a poor material from the standpoint of radioactivity, but it was felt that the small quantity used for stelliting the tips of the last stage blades would be justified. To prevent leakage, all piping connections are welded and the turbine exhaust is welded to the condenser.

Condenser Tubes Are Aluminum

The condenser is a single pass divided water box type with double tube sheets on each end, the space between the tube sheets being piped to a vacuum tank where any leakage can be detected. The hot well is divided longitudinally and has separate condensate outlet connections on each half of the well, with separate conductivity measurements to determine existence of leakage in either side of the condenser. The side of the condenser which develops a leak may be drained into a 1200 gal tank. Draining of the condenser can be regulated by motor operated valves operated from the control room.

The condenser is arranged to also receive bypass steam from the control valve as well as from the safety valves on the reactor. The condenser will be provided with a rupture diaphragm designed to blow out at 20 psig. The hot well is designed for complete deaeration and 0.01 cc per liter is guaranteed, but it is hoped that the oxygen content will be half of that. The condenser shell, water boxes, and tube sheets are of carbon steel. Condenser tubes are of Type 6063-T831 aluminum. The tubes at the top of the bundle are protected from water erosion with stainless steel clips over the top of the tubes. The erosion of the aluminum tubes will result in less radioactivity.

The condenser will have a two element, two stage air ejector. Air will be piped to the air drying fluid recovery system. Ejectors are of stainless steel, and intercooler and aftercooler shells are of carbon steel, nickel plated on the inside. Aluminum tubes are used in the coolers. Control valves for the ejector are designed for remote operation from the control room.

The circulating water is cooled in an induced draft cooling tower. A deep basin is provided under the tower with approximately 100,000 gal storage. The piping arrangement is such that a certain amount of natural circulation will be available through the condenser even when all auxiliaries are shut down, thus providing for the absorption of shut down decay heat with all auxiliaries out of operation.

The circulating pumps are arranged on the outlet side of the condenser in order to reduce the condenser water box pressure, thereby minimizing leakage.

Other plant cooling is provided through auxiliary cooling water pumps which also take the suction from the cooling tower basin. The capacity of the cooling water pumps is 600 gpm, compared to 6850 gpm for the circulating pumps.

Circulating water is treated to prevent scale deposit and to control the pH of the water, and is chlorinated to prevent growth of algae.

Feedwater Pumps Cut Leakage

Condensate from the condenser will be pumped back to the reactor by a combined condensate and feed-

water pump in order to reduce the leaking and control problem to a minimum. The pumps are made of alloy steel, and water cooled bearings are used. Pumps have flanged inlet and outlet connections so that they can be removed for maintenance. Each pump will have a combination labyrinth and mechanical seal. The flanges are furnished with three neoprene O-rings. The outer space between the rings will be supplied with dry air, and the inner space will be connected to the leakoff return to the fluid recovery system.

Outer and inner casings are supplied with drains. Starting switches for the pumps are in the control room. The suction valves have limit switches interlocked so that the pump cannot be started unless its suction valve is open. The motor has thermocouples to indicate bearing temperatures and resistance temperature detectors to indicate winding temperatures. A recirculating valve will be provided for low flow operation.

In order to prevent foreign particles from getting into the reactor, all condensate will be pumped through a high pressure filter before it enters the reactor. The filter is a cotton fiber filter with cylindrical filter cartridges. Each filter has 75 cartridges and is capable of removing particles as small as 2 microns. The filter pressure vessel is carbon steel, with stainless steel cladding with a flanged top cover. Double O-rings are used with leakoff similar to that for the feed pump. Two filters will be used so that one can be repacked when the other is in use.

Maintain 100 to 650 Psig

To maintain the pressure in the reactor within 1 percent, a portion of the steam will normally bypass the turbine and flow directly to the condenser. A regulating valve in this line will regulate the flow to maintain constant reactor pressure.

Normally, the amount of steam bypassed will vary with load changes on the turbine. This regulating valve will be oil operated, and separate oil pumps are furnished as part of the system. The valve can operate at any set level between 100 and 650 psig.

Use Stainless Steel Piping

The reactor will be kept as free as possible of erosion and corrosion products in order to reduce radioactivity carried with the fluid. The reactor has been designed so that it could be operated with heavy water, which at the present time costs $28 per lb. In order to conserve heavy water as well as eliminate contamination, an effort was made to make the entire piping and valve system as tight as possible. In the steam piping system, stainless steel is used from the reactor to the steam separator and carbon steel to the turbine. The auxiliaries connected directly to the reactor use stainless steel. This includes piping for the startup heater, reactor purification, boric acid injection, shield flooding, feedwater, also stainless cooling water column and instrument gage connections. The turbine and condenser are not of corrosion resistant materials, so there appeared to be little gain by making this part of the steam piping of stainless steel.

Stainless steel is used in the piping from the feed pump outlet to the reactor. Other piping is of standard materials. This includes carbon steel piping for emergency shutdown, cooling water from the overhead tank, spray system, retention tank, service air, air to ejector, circulating water, and heating system. Copper tubing is used for shield cooling, control air, and domestic and laboratory water. Cast iron is used for underground water supply. Valves in the steam and condensate system and the auxiliary system are of stainless or carbon steel to match the piping.

To reduce leakage, a modification of a standard valve is used. For the smaller size, valves with a deep stuffing box are used. A hole is drilled to provide a leakoff from a lantern gland. The leakoff can then be checked or piped to the fluid recovery system. For the larger size high pressure valves, a pressurized sealed bonnet is used together with a leakoff for the valve stem. In the case of air ejector air piping, fluid recovery system piping and retention tank piping, leakage is again a problem. For these systems, a diaphragm type of valve is used. For general use around the plant, standard valves are used.

Plant Cost $3½ Million

At the present time, any close cost analysis of an atomic power plant is of little significance, particularly for an experimental project.

The initial costs are way out of proportion to what they will be when the development is established. Also, the prices bid for different equipment and services may not always reflect the true cost.

The overall cost of equipment and construction for this plant is about $3½ million not including the cost of the core. Many costs would not be materially different if the capacity of the plant were many times greater. Also, it should be kept in mind that due to the experimental nature of the plant expensive provisions were made for safety and experimentation which would not be included in a standard plant of this type. ≠

"Most Modern" System Conditions Skyscraper

THE "MOST MODERN" type of air conditioning system will cool tenants of New York's newest skyscraper, the 31 story office building at 485 Lexington Ave., according to the York Corp.

Two powerful steam turbine driven centrifugal compressors, each with a capacity of 1200 tons of cooling, form the heart of the air conditioning system. The compressors will be installed in the basement equipment room.

About 2000 fan-coil window units will cool perimeter offices on the 31 floors. Interior parts of each floor will receive conditioned air through ceiling outlets.

The building will contain 37 fan rooms.

The air conditioning contractor is the Raisler Corp. ≠

"HELLO, HARRY. I'm finished over here. What's the next job?"

"HI, JOE. Mr. Smith at the hospital has an oxygen piping leak. Run over and check on it, will you?"

Radio Phone Improves Operations Of This Mechanical Contractor

Wireless communication links delivery truck and supervisor's sedan as well as permitting each to receive and transmit from and to the firm's headquarters station. Main transmitter in contractor's warehouse sends messages for dispatching, routing, and field contact and receives reports for synchronizing work activity with delivery schedules.

TWO-WAY radio communication links mobile field units and the engineering offices of Charles Simkin & Sons, Inc., Perth Amboy, N. J., mechanical (heating, piping, and air conditioning) contractors.

The radio phone system, similar to that used by taxicab services, supplants regular telephone circuits, which were formerly relied upon for administrative contact with all distant and remote job locations. The difficulty and expense of stringing special trunk lines, and the frequent jam-up of busy channels that occurred when commercial telephone hookups were employed caused the firm to turn to a more satisfactory means of communication.

The switchover noticeably improved overall control, according to Theodore Simkin, secretary. Deliveries of material, pickup, and routing of radio equipped trucks can be directed from a base point, which means that emergencies are quickly met by shunting rolling stock while in transit. No delays are encountered as is often the case with commercial switchboards. Coordinated surveillance over every phase of its complicated and far-flung operation can be maintained from a master station.

The new system has met with such success that all key rolling stock and stationary construction shanties are now equipped with radio telephones which can be reached by every other instrument operated on the company's assigned frequency. The signal, sufficient in strength for the firm's coverage, is beamed to a radius of 50 miles from the base station. ⧺

The Law and Your Profits

By William Hurd Hillyer

Never Take Anything for Granted

Don't depend on an implied contract. Reduce every agreement to writing to be sure that parties understand and accept all terms.

BOREALIS BROS. owned a cold storage plant. The local public utility company measured the electric current needed and orally agreed to furnish the required electric energy. Subsequently, the cold storage firm suffered loss when the current fell below the requisite voltage. They sued the utility company for reimbursement, but the trial court held that the brothers had failed to show an implied contract, because they could not sustain the heavier burden of proof as compared with an "express" contract. This finding was upheld by the state supreme court.

The utility company well knew, declared the three dissenting justices, that Borealis Bros.' machinery would require 220 volts in order to sufficiently chill the temperature for preservation of meats in storage. Defendant corporation also well knew that if the voltage were permanently to fall below 200, the storage rooms would not be sufficiently chilled.

Borealis Bros., the justices stated, had stored 100,000 lb of meat at a required temperature of 13 F below zero. Not long thereafter, "with no opportunity" for the cold storage people "to protect themselves," the temperatures rose to a point where the meats spoiled and huge loss was sustained. The dissenting justices were of the opinion that the lower court's decision should have awarded damages; but the majority judgment stood, and the cold storage firm was a heavy loser. They suffered thus because they did not reduce agreements to writing and disregarded this simple maxim: Never take for granted what the other party should know or what may be in his mind.

Recovery Pleas Denied in Two Cases

UNJUST ENRICHMENT is the basis for another utility case. Refund of such enrichment is likewise the bone of contention. A group of consumers got together and brought an "equity action" against the Central County Gas Co., a local utility, to recover an interest in certain funds reserved by that corporation under rather unusual circumstances. It had drawn down some $25,000 consisting of monies impounded by the U. S. court following a federal commission's reduction order of rates on natural gas bought by Central County Gas from another corporation. The petitioning group wanted these savings "passed on" to consumers. The state supreme court held on appeal that the distributing utility's customers were not entitled to recover on the theory of unjust enrichment. "Courts of equity," the justices opined, "cannot disregard statutory and constitutional requirements, any more than can a court of law."

Another refund case against a public utility company directly concerns a heating installation. A hotel owner, Hart E. Boniface, applied to the local light and power company for connection with its wires. Having told its representative that he intended to use electricity for both lighting and heating, he was informed that if he were going to use much current for heating, he would save money by putting in two meters. Boniface, nevertheless, installed only one meter and paid for the electricity at lighting rates.

Had he installed a second meter, the current he used for heating would have cost only about one-fourth of what he actually paid. After operating this way for a year, Boniface woke up. He sued the electric company for the difference between what he paid for the heating current and what he would have paid for such

WILLIAM HURD HILLYER, *author of this regular feature, is a contributor to a number of banking and financial publications and has written several books on business. He has an extensive practical legal and financial background.*

This series presents actual cases. Naturally, laws vary in different states. All names are fictitious.

current had he provided himself with an additional meter.

The state supreme court ruled on appeal that the public service company, by telling the hotel man that he would save money if he installed a second meter for heating, thereby sufficiently discharged its duty, if any, to inform him regarding the economical way to use its commodity. "Neither statute nor common law imposes a duty on a public service corporation . . . to inform customers as to the use of electricity — or gas — furnished." The company's only pertinent statutory duty, the high tribunal declared, is "that of making and publishing rates and charges."

This dictum may well be borne in mind, both by heating and air conditioning engineers and contractors and their clients, in dealing with a public utility company and in formulating layouts with operating costs.

What If Utility Competes by Selling Equipment?

PUBLIC UTILITY companies have been known to enter the heating and air conditioning field as active competitors of regular air conditioning contractors. A case of this kind was recently decided. The question at issue was whether the utilities commission has the power to prohibit a gas company from selling and installing air conditioning equipment in competition with firms engaged in the business. Complaint against the gas company was filed with the commission by an association of air conditioning contractors, alleging that the gas company had for a number of years been engaged "in the retail sale and installation of equipment."

The association asserted that the merchandising of fixtures and appliances is properly a nonpublic utility operation. The gas company was represented by the contractors as occupying "the favored position of a protected monopoly in its public operations with an assured profit, part of which profit it is using in destructive competition with private enterprise." The association accused the gas company of deliberately losing about $140,000 during 1952-53 in these nonpublic operations "through its practices of underbidding its competitors." The air conditioning contractors therefore asked that the gas company "be prohibited from engaging in private business."

The utilities commission disclaimed all jurisdiction in the matter, and was upheld by the circuit court. Affirming the lower court's ruling, the supreme court laid down the principle that, "just as a municipal corporation may act in either a governmental or a proprietary capacity, so also a public service corporation may act in some matters as a public utility and in others as a private corporation. Furthermore, declared the higher court, the gas company's charter gave it the power to sell equipment; therefore it is not "acting *ultra vires*."

As for the losses supposedly sustained by the gas company "in its private business of selling air conditioning equipment," such a matter would be properly taken up by the commission on a rate fixing basis, not by a court of law. By judgment, the air conditioning contractors were denied legal relief from public utility competition. ⧺

New Shopping Center Gets Central Air Conditioning

. . . 960 *tons serve* $5 *million project*

IN THE NEW $5 million Oak Cliff shopping center in suburban Dallas, a deluxe air conditioning system provides complete air conditioning for each store according to its individual requirements, according to The Trane Co. The total capacity is 960 tons.

Three large refrigeration units are the central source of chilled water. They can operate from 100 to 10 percent of their rated capacity, adjusting to varying loads with a minimum of power consumption.

The full load capacity is available on Saturday, when all the stores are open. But the automatic controls adjust the output to as little as the 30 ton load required on Sunday night, when only one drug store is open.

The chilled water is piped to cooling coils in air distribution units. One or more units serve each store. The units are mounted in a monitor area over the landscaped mall which connects the stores. They heat and cool the air, filter dirt and dust, remove moisture, mix in outside air, and gently circulate it. An economizer cycle of control providing maximum use of outside air operates in each unit.

A boiler generates steam for the heating coils in the units for winter.

The largest single store in the center is a three level store unit, has two large dehumidifier coil banks on the roof, which provide cooled and dehumidified outside air to 16 mixing units throughout the store. The mixing units automatically provide proper combination of conditioned and recirculated air to maintain ideal comfort conditions in individual zones. This method eliminates the need for piping chilled water and steam throughout the building.

No noise or fumes from trucks can reach the stores, driveways, or parking lot. All shipping is through an underground load facility with its own approach, roads, and exits.

Architects Harwood K. Smith and Joseph M. Mills designed the center in cooperation with Welton-Becket & Assoc., consulting architects. Mechanical engineers were Blum and Guerrero. The air conditioning contractor was the Sam P. Wallace Co. ⧺

On the Job
—notes from the field

Did Air Conditioning Give Lift To Redlegs in Pennant Race?

THE CINCINNATI REDLEGS, one of the "hottest" teams on a major league baseball diamond this year, was certainly the coolest in the dugout. Dugouts were air conditioned at the start of the season — See the April HPAC — along with the press box, broadcasting booth, press room and TV monitor room.

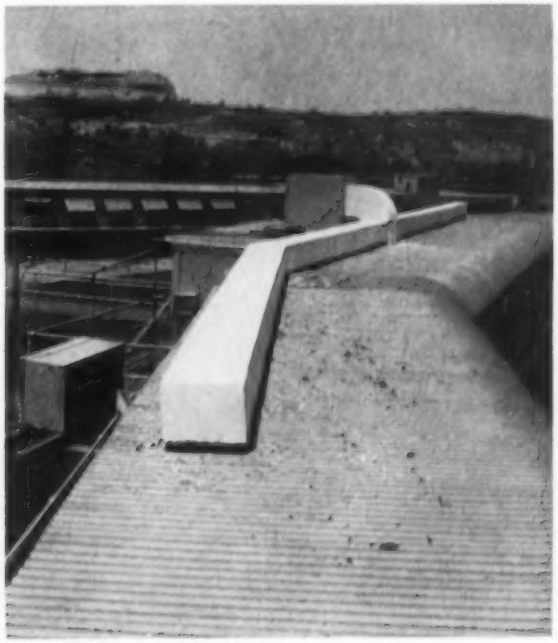
Dugouts were always considerably hotter than the stands because the players' areas are protected from the sun only by a low flat roof and enclosed on three sides, preventing circulation of air. In the metal press box high atop the grandstand, temperatures were frequently above 100 F. Both are now comfortably cool, with 5 hp condensers and fan-coil units.

The radio booth, a 6 ft sq cubicle alongside the press box, is cooled by a 1 hp room air conditioner. Because the booth is open in front from about 30 in. above the floor, the unit is installed through the lower rear wall. Thus, the well is filled with conditioned air which spills up around the announcers and out through the front opening.

The air conditioning contractor was Bachman's Refrigerating-Heating, Inc., of Cincinnati. ⋕

10 F COOLER INSIDE, open fronted dugout is "enclosed" with a 36 ft curtain of cool dry air from a diffuser along the length of the ceiling. A 5 hp water cooled condensing unit and a coil and blower unit are installed in each dugout

EIGHT CEILING DIFFUSERS supply 100 percent outdoor air. A thermostatic control maintains a temperature differential of about 15 F. Ceiling has 2 in. insulation, walls 1 in.



TUNNEL SHAPED PRESS BOX — 6 × 6 × 40 ft long — is supplied through a 40 ft duct along the roof. A 5 hp air cooled condenser and fan-coil unit serve this area

Consumable Solid Insert Rings Improve Pipe Welding Quality

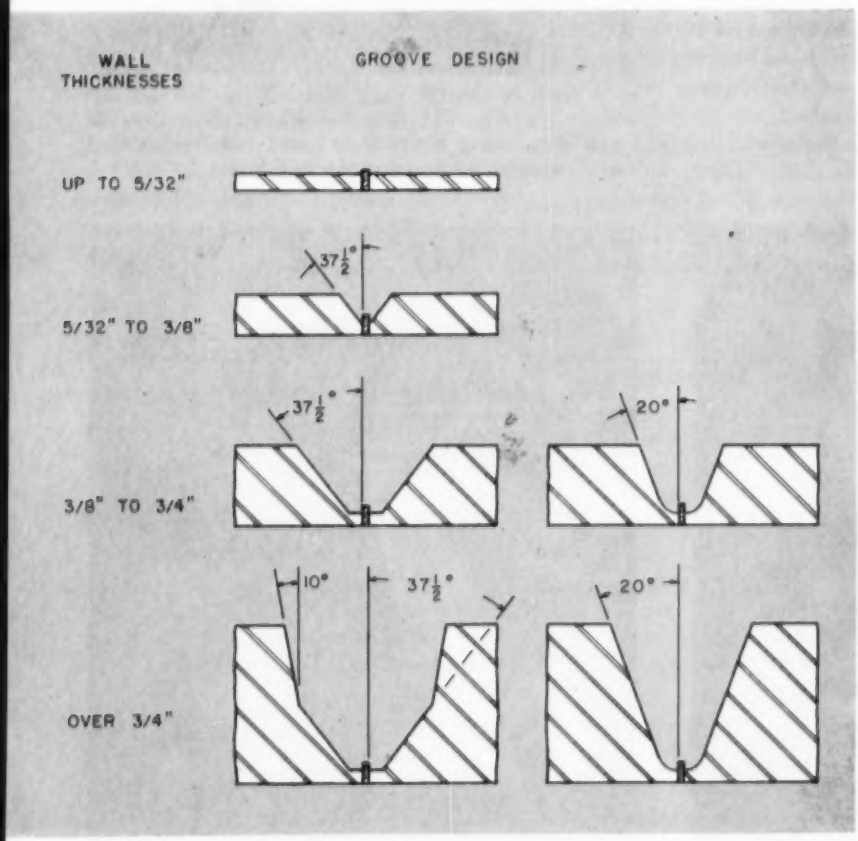
- **by minimizing human variable welding effects**
- **by giving favorable weld contours that resist cracking**
- **by producing metallurgically sound weld metal composition**

THE inert gas tungsten arc welding process is being applied in an increasing degree to the welding of piping materials. Particularly on stainless steel piping this process is being extensively used where quality welds are desired.

The use of consumable insert rings, available in various sizes for pipe diameters from 2 to 16 in., is often insisted upon for producing welds of the highest quality. In piping for atomic reactors, where weld joint "perfection" is of extreme importance, almost all welding authorities agree that acceptable welds in stainless steel piping can be made only with consumable insert rings.

Standard insert ring sizes for the respective nominal pipe sizes were given in a previous article in the September HPAC. Also given were insert ring dimensions for piping with internal diameters machined in accordance with dimensions of Pipe Fabrication Institute Standard ESI-1956.

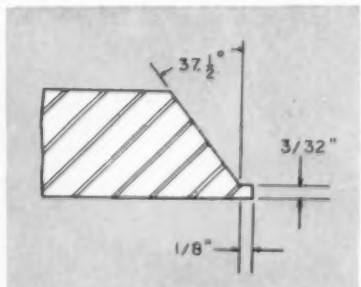
The present article covers recommended joint designs, and methods of making the weld.



6 RECOMMENDED JOINT DESIGNS for inert gas tungsten arc welding with insert rings include — for various pipe wall thicknesses — bevels of the "flat-land," "U," and "V" types. The flat-land is preferred for thicknesses over 5/32 in., because it is relatively easy to perform

Recommend Joint Designs

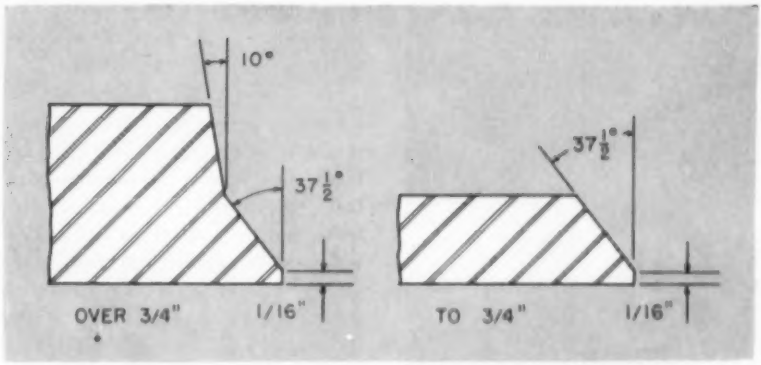
The recommended joint designs are given in Fig. 6.



7 FLAT-LAND BEVEL, prepared as shown here, is preferred for "difficult to weld" alloy steels considered highly susceptible to centerline and crater cracking

By Helmut Thielsch

Metallurgical Engineer
Grinnell Co.

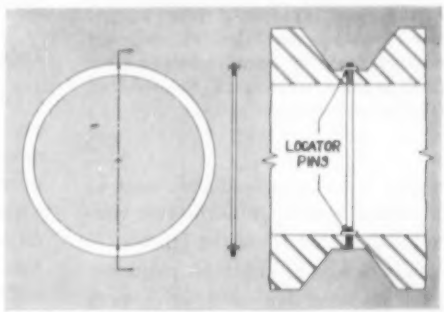


8 V-BEVELS like these, frequently found on standard fittings, are primarily suitable for shielded metal arc welding with covered electrodes

On Schedules 5 and 10 piping, a square end preparation is considered the most economical and satisfactory.

On piping of wall thicknesses over 5/32 in. the so-called flat-land bevel preparation shown in Fig. 7 provides consistently the best results, particularly with welders who have had little experience in inert gas tungsten arc welding. However, the U-bevel is also generally satisfactory.

Frequently, standard fittings are furnished with the V-bevel preparations recommended in the American Standard Code for Pressure Piping, as shown in Fig. 8. Although it would be considered desirable to remachine the V-bevels to the dimensions shown in Fig. 7, this may involve considerable additional cost. Where welders experienced with inert gas tungsten arc welding of piping are employed, good welds may be obtained by joining, for example, a fitting having a V-bevel to a pipe with a flat-land bevel. Of course, where a V-bevel is joined to a flat-land bevel, the welding torch should be inclined slightly towards the V-bevel.



9 ECCENTRIC RING POSITION for horizontal fixed position welding enables ring to compensate for downward sag of molten weld metal and aids in obtaining smooth uniform root contours along the ID of the joint

On some of the more "difficult to weld" alloy steels which are considered highly susceptible to centerline and crater cracking — as the chromium-molybdenum (P11, P22, and P5) alloy steels and Type 347 stainless steel — the flat-land bevel preparation would be definitely preferred, even where experienced welders are available.

How to Insert Ring

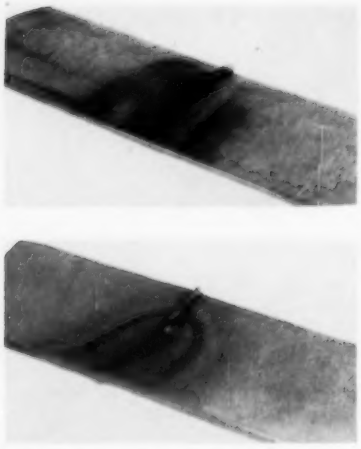
In horizontal rolled (1G) and vertical (2G) position welding, the insert ring should be "inserted" into the beveled pipe concentric.

In horizontal fixed (5G) position welding, the insert ring should be "inserted" eccentric to the centerline of the pipe, as shown in Fig. 9. In this position the insert ring compensates for the downward sag of the

TABLE 4—RECOMMENDED WELDING CONDITIONS are given here for inert gas tungsten arc welding of piping with consumable solid insert rings

Groove preparation	Pipe position	Current — amps		Voltage	Shielding, cfh		Purging, cfh*
		Carbon steel chromium-molybdenum alloy steel**	Stainless steel		argon	helium	argon
37½ deg V-bevel	1G — H (rolled)	100-120	90-110	13-15	15-20	25-35	5-15
1/16" land	5G — H (fixed)	95-110	85-100	12-14	15-20	25-35	5-15
	2G — V	100-120	90-110	13-15	15-20	25-35	5-15
37½ deg Flat-land bevel	1G — H (rolled)	95-110	85-100	12-15	15-20	25-35	5-15
	5G — H (fixed)	90-105	80-95	11-13	15-20	25-35	5-15
3/32" land	2G — V	95-110	85-100	12-15	15-20	25-35	5-15
20 deg U-bevel	1G — H (rolled)	90-105	80-95	12-15	15-20	25-35	5-15
1/16" land	5G — H (fixed)	85-100	75-90	11-13	15-20	25-35	5-15
	2G — V	90-105	80-95	12-15	15-20	25-35	5-15
37½ deg V-bevel to	1G — H (rolled)	95-110	85-100	12-15	15-20	25-35	5-15
	5G — H (fixed)	90-105	80-95	11-13	15-20	25-35	5-15
37½ deg Flat land bevel	2G — V	95-110	85-100	12-15	15-20	25-35	5-15
37½ deg V-bevel to	1G — H (rolled)	90-105	80-95	12-15	15-20	25-35	5-15
	5G — H (fixed)	85-100	75-90	11-13	15-20	25-35	5-15
20 deg U-bevel	2G — V	90-105	80-95	12-15	15-20	25-35	5-15

*Rate of flow will vary with pipe size, quality of fit-up, and weld progression to maintain 0.20 to 0.30 oz per sq in. positive gas pressure.
**When helium is used as a shielding gas, a slightly lower current range is sometimes preferred.



10 PARTIALLY WELDED INSERT RINGS join Schedule 5 pipe sections here. Locator pins help position rings eccentric to the pipe centerline for fixed position welding of flat-land and U-bevel preparations

molten weld metal and aids most in obtaining smooth uniform root contours along the ID of the joint.

Where insert rings with positioner pins are used for fixed (5G) position welding of flat-land and U-bevel preparations, the part of the ring containing the locator pin closest to the OD of the ring should be inserted at the top of the pipe. Schedule 5 pipe sections with partially welded insert rings are shown in Fig. 10.

It is sometimes desirable to spot tack weld the insert ring to one of the pipe ends at two locations before assembly of the joint. One procedure of doing this consists of striking the arc on a small copper plate placed on the inside of the pipe near the bevel, as shown in Fig. 11, and "touching" the arc to the edge formed between the ring and the inside of the pipe.

Welding Conditions Given

Recommendations for the welding settings found most suitable under average pipe welding conditions are given in Table 4.

Thoriated tungsten electrodes, 1/16 in. or 3/32 in. in diameter, are generally used with a ground "pencil point" tip. The tip should project below the torch cup by about 3/16 in.

All welding should be done with direct current, straight polarity; i.e., the electrode should be connected to the negative side of the line.

On stainless steel piping, argon is generally the preferred gas for both shielding and purging. Shielding refers to the "flowing" of the protective inert gas around the tungsten electrode and the surface of the molten weld metal puddle. Purging refers to the protection of the inside of the pipe along the underside of the weld with a gas, usually argon, helium, or nitrogen. On carbon and chromium-molybdenum alloy steels, helium is sometimes preferred for shielding.

Tolerates Wider Misalignment

Considerably wider misalignment can be tolerated with the insert welding ring than would be considered permissible with other techniques. Under average welding conditions an offset of about 3/32 in. and a gap of 1/16 in. can be readily welded. In fact, with expert welders, greater offsets and wider gaps can be "bridged" without resulting in defective welds.

Spot Tack Weld Ring to Pipe

Although tack welding may not be necessary where the piping is securely fixtured by means of external line-up clamps, it is usually desirable.

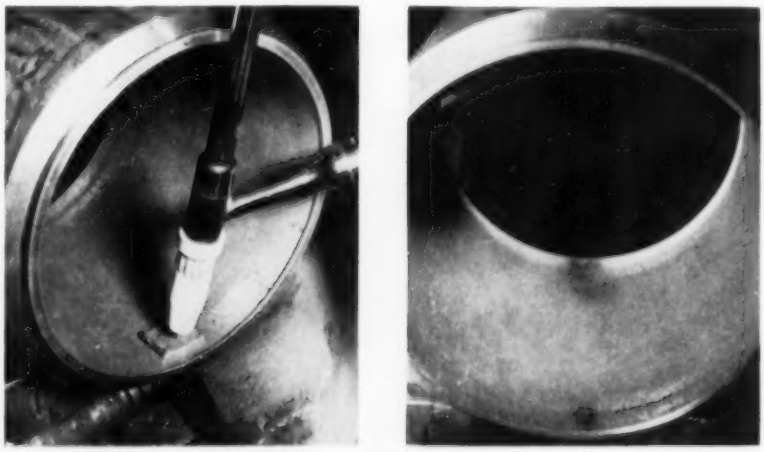
On pipe diameters up to 4 in. inclusive, two 1/8 to 1/4 in. long tack welds should be made on opposite sides of the pipe. On larger pipe diameters, four or more tack welds should be made at equal distances from each other, with an approximate distance between tack welds of no more than 6 in.

The tack welds should not be fused through the full thickness of the insert ring and land. Moreover, before breaking the arc, the tungsten electrode should be manipulated slowly toward and up the side of the bevel, Fig. 12. This will help to avoid weld craters and cracks.

Hold Torch Perpendicular

The inert gas tungsten arc welding torch should be held perpendicular to the joint area and be directed towards the center of the pipe, as in Fig. 13. The arc length should be approximately 1/8 in. long. A slight weaving forward progression should be employed at the start of welding. As the base metal becomes heated up and the weld metal pool more fluid, the forward motion should become more straight and uniform.

Before the arc is broken, the welding torch should be manipulated slowly toward and up the side of the



11 SPOT TACK WELDING of insert ring, in two or more equidistant places at one of the pipe ends, is sometimes desirable before assembly of the joint. One method is to strike the arc on a small copper plate placed inside the pipe near the bevel and "touching" the arc to the edge formed between the ring and the inside of the pipe

bevel. When completing the root pass, an experienced welder may prefer to "feather out" the arc gradually over a distance of about 1 in. over the root weld section previously welded, instead of breaking the arc on the side of the bevel.

In welding the horizontal fixed (5G) position, the weld should be started at the bottom of the pipe, and welding should proceed toward the top, first completing one half and then the other half of the pipe joint.

Convex Contour Resists Crack

The cross section of properly made insert ring welds should show a slight convex curvature on the top and bottom of the weld. A typical cross section of a single pass inert gas tungsten arc weld made with an insert ring is shown in Fig. 14. The slight convex contour desired provides the greatest resistance to centerline or crater cracking. Concave contours, frequently encountered when welding without insert rings on many alloys, tend to be more susceptible to cracking.

The fact that the projection into the inside of the pipe is very small represents one of the major advantages of this insert ring design.

How to Complete Weld

On piping of wall thicknesses over 1/4 in., where the root pass only is to be made by inert gas tungsten arc welding, the balance of the weld is usually completed by shielded metal arc welding with covered electrodes.

Other welding processes, such as automatic submerged arc welding and consumable metal arc shielded gas welding, are also occasionally used in shop fabrication.

Special Sealer Aids Purging

On stainless steels, and frequently also on alloy steels, it is desirable to protect the underside of the weld from oxidation and discoloration. This protection is done by displacing the air underneath the joint area with inert gas. Argon is generally preferred on stainless steels and helium on carbon and chromium-molybdenum alloy steels. On austenitic stainless steels, nitrogen also has been found satisfactory as purging gas.

On short lengths of piping or tubing the open ends are usually sealed off or capped, and a liberal amount of the purging gas is introduced through the cap to displace the air from the enclosed area. On sections of considerable length, special sealing fixtures are frequently employed to produce a narrow enclosed area with the weld at its center. Fixtures of the type shown in Fig. 15 minimize the amount of inert gas required for purging, since the relatively high cost of the gas adds considerably to the cost of fabrication.

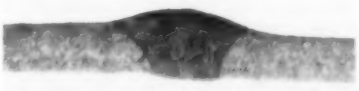
12 PARTIALLY FUSED TACK WELD, 1/8 to 1/4 in. long, should not extend through full thickness of ring and land. Before arc is broken, tungsten electrode should be manipulated slowly toward and up side of bevel

13 PERPENDICULAR APPROACH of inert gas tungsten arc welding torch to joint area is directed toward center of pipe. Arc length should be about 1/8 in. long

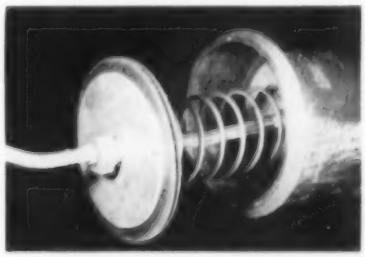
Inspect Root Pass Carefully

The root pass should be carefully inspected by visual examination for crater and centerline cracking. This inspection should be done in the "as welded" condition. Grinding, chipping, or wire brushing should be done only after the visual inspection of the root pass has been completed.

In certain cases where the piping is destined for very critical service applications — atomic reactors, for example — it may be advisable also to check the homogeneity of the root pass weld by means of dye penetrants or radiographic inspection techniques.

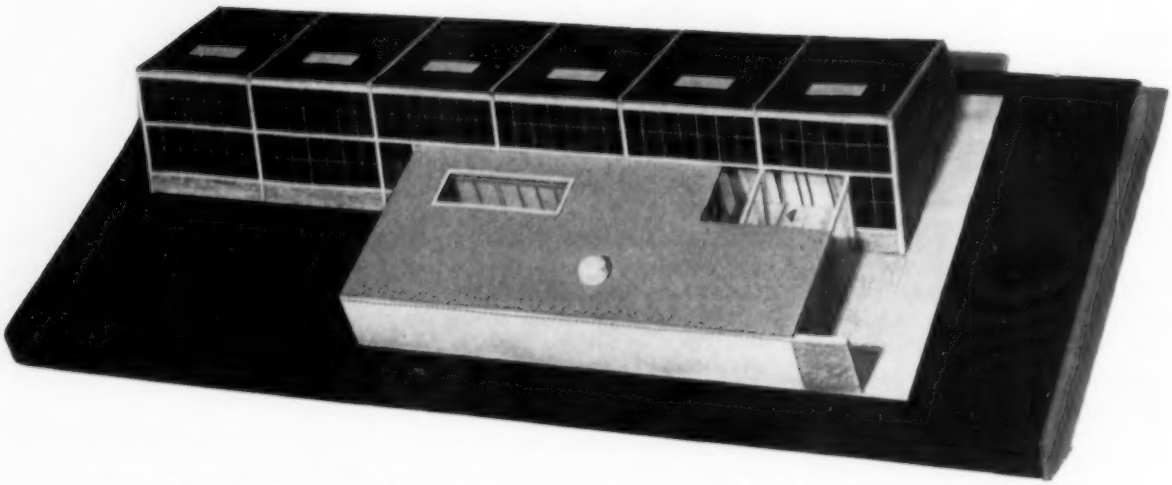


14 CONVEX CONTOUR of single pass inert gas tungsten arc weld in stainless steel pipe made with insert ring provides great resistance to centerline or crater cracking



15 SPECIAL SEALING FIXTURES for use on long sections of pipe produce narrow enclosed area with weld at center to minimize amount of inert gas for purging

Solar Collector and Heat Pump Heats, Cools New Office Building



SOLAR HEATED OFFICE BUILDING, air conditioned, recently completed in Albuquerque, N.M., will be studied to improve design of future similar buildings. Cost of this 4300 sq ft building — model shown — about $13.45 per sq ft, equals average cost of comparable buildings in area with year 'round air conditioning

By Roger Haines

Chief Engineer
Bridgers & Paxton
Consulting Engineers

JUST recently completed in Albuquerque, N. M., is a unique office building, believed to be the first commercial building in the U. S., and possibly in the world, to be completely solar heated. Designed by our firm, it is used by us as an engineering office.

Operating and performance data obtained from the system will serve as a basis for the design of similar buildings. This data will also be carefully compared with the design calculations to determine the degree of accuracy of theoretical predictions, and to improve future designs. The economics of this type of system will also be surveyed.

The 4300 sq ft building cost $57,818, or about $13.45 per sq ft. This is about the same as costs for comparable buildings in this area with complete year 'round air conditioning and leads to the optimistic conclusion that the design is economically sound, since it is known that operating costs will be much lower than with a conventional gas fired boiler or furnace.

The system consists, essentially, of an 830 sq ft flat plate solar collector using water as the heat transport medium, a 7½ ton water chiller which is operated as a heat pump in winter and used for cooling in summer, a 6000 gal water tank for heat storage, an evaporative water cooler (used in summer only), two pumps for circulating water through the system, and a distribution system for heating or cooling the building. The distribution system includes floor and ceiling radiant panels and an air system for ventilation.

Considerable theoretical and empirical data on the design of flat plate solar collectors is available, showing efficiencies of various designs under varying conditions of orientation and tilt. A study of this data resulted in the use of a south facing flat metal plate collector with one glass cover, the whole being tilted 30 deg from the vertical. This arrangement should result in the maximum efficiency for a fixed collector during December and January. The sloping collector is used as one wall of the building. The plates used here are aluminum and are made by the same method used for domestic refrigerator evaporator liners. The pattern for the water channels is marked out with parting compound on a sheet of brazing aluminum. Another sheet is placed on top, and the two are bonded together by pressure and heat. The passages, which do not bond because of the parting compound, are then expanded hydraulic-

The first commercial building in the U.S. to be completely solar heated utilizes radiant panels for heating and cooling and an air system for ventilation, providing year 'round air conditioning. Here's how collector efficiency and size were determined, how system components were designed, and how a 7½ ton heat pump became a basic part of the design conception.

ally to the required shape and size. Plates made this way are comparatively inexpensive and very efficient because of the high percentage of prime surface.

The mechanism by which the collector operates has been described as follows. Consider solar radiation as being made up of billions of tiny particles of energy. These particles contain a fixed amount of energy which depends on the wave length. The shorter the wave length, the higher the energy value. Wave lengths of solar energy particles in general lie in the visible and the ultra violet spectrum. The glass cover is transparent to this short wave radiation and the particles pass through easily and strike the collector plate. Each tiny energy particle sets an individual molecule of the collector surface in motion, causing the energy to be released in several particles, each of a lower value, in the infrared spectrum (heat). The glass cover is opaque to this longer wave energy radiation and the heat is trapped, conducted to the water in the tubes, and conveyed to heat the building.

Store Heat For Nights

A true solar heating system must include some provision for storage of heat to be used at night or on cloudy days. The type of storage medium to be used is the subject of considerable research and cogitation, but so far, no completely acceptable answer has been found. The ideal medium would be a liquid with a low fusion point — 95 to 100 F — and a high latent heat. Most of the materials so far proposed have the drawbacks of high cost or corrosive effects or both. Water has the advantages of being cheap, relatively non-corrosive, and easy to obtain, handle and store. This system, therefore, uses a 6000 gal underground water tank as the storage element. This represents a capacity of 50,000 Btu per F change in the storage temperature. Water from the collector passes first through the storage tank and then to the other parts of the system. A small amount of water treatment is necessary because both steel and aluminum are in contact with the water.

Use Low Temperature Water

The heating of the building is accomplished through ceiling and floor radiant panels, with tempered outdoor air for ventilation supplied through a central air system. Panel heating was used because lower water temperatures are needed for this type of system, and the efficiency of the solar collector is to a great extent a function of the collector temperature, running from about 35 percent at 110 F collector temperature to as high as 85 percent at 40 F collector temperature.

The six-row coil in the air system also allows the use of low temperature water. The summer cooling load is carried by the ceiling panels and the air system since floor panels are not satisfactory for cooling.

Heat Pump Solves Problem

Whenever conditions allow, the system operates directly from the collector through storage to distribution. However, during prolonged periods of high heating demand and low solar energy availability, the temperature of the storage water may drop below the level necessary for satisfactory heating of the building. This could be overcome by increasing the size of the collector and/or storage tank but this raises difficult architectural, economic, and space problems.

Also, since the efficiency of the collector increases as collector temperature decreases, some device for raising the temperature level of the water in the distribution system while allowing storage and collector temperatures to fall — to as low as 35 F — will increase both storage and collector capacity. A heat pump is an obvious, simple and effective solution. Since the heat pump can also be used for summer cooling, utilization and economic factors are good.

The evaporative water cooler serves as a cooling tower for the heat pump on the summer cooling cycle. It can also be used at night to cool water which can then be stored for use during the day.

Provide Five Basic Circuits

The piping system is provided with a number of automatic valves to provide five basic circuits for various combinations of heating load and solar energy availability or cooling loads:

1) *Heating directly by solar energy.* When solar radiation and storage temperature are at a high enough level, water circulates through the collector, to the storage tank, through the distribution system and back to the collector. During the night or short periods of low energy availability, the collector may be bypassed.

2) *Heating with heat pump.* During a long period of high heating demand and/or low energy availability, the storage water temperature may decrease to a point below that neces-

sary for heating the building. At this point, the system automatically goes over to the heat pump cycle, the refrigeration compressor starts, and there are now two circuits: one through the collector to storage, to the chiller, and back to the collector; the second through the condenser to distribution and back to the condenser. During this cycle, the storage water temperature tends to remain at a low level and it is desirable to prevent a return to the first cycle until the storage water temperature reaches a point above that leaving the condenser. This is accomplished by means of a differential thermostat.

3) *Storage of cooled water.* During the cooling season, cold water can be stored in the tank by operating the evaporative water cooler at night and then drawing on this storage during the day. The very low wet bulb temperatures prevailing in Albuquerque make this system very satisfactory and economical. For this circuit one pump operates and the flow is from cooler to storage and return.

4) *Cooling with evaporative water cooler.* During the greater part of the cooling season it is sufficient to store cooled water during the night and to continue using the cooler during the day to prevent excessive depletion of the stored "cold." For this circuit, the flow is from cooler to storage to ceiling panels and air handling unit and back to the cooler. The floor panels are not used for cooling.

5) *Cooling with heat pump.* When the cooling load exceeds the capacity of the above circuit (4), the heat pump is used as a conventional refrigerating machine. There are two circuits: one from evaporative water cooler to condenser and return; one from chiller to ceiling panels and air handling unit, returning to chiller through the storage tank or storage tank bypass.

How System Was Designed

The designer of a solar heating system faces several problems, not the least of which is the fact that there is no established design procedure.

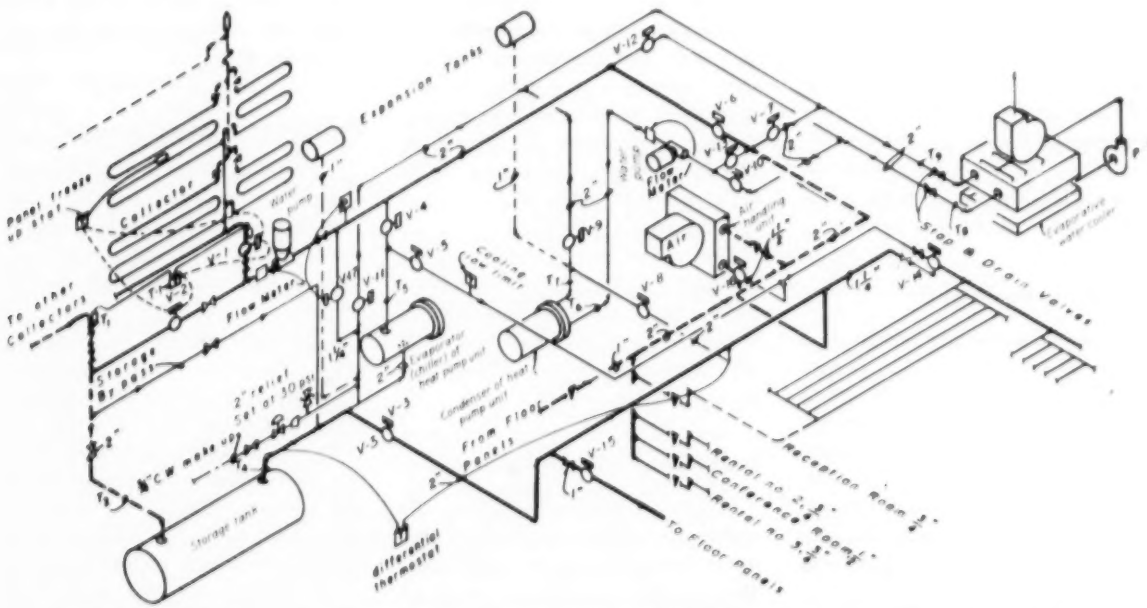
It was necessary, therefore, to first establish a rational basis for design. The theoretical procedure worked out by R. C. Jordan and J. L. Threlkeld in their article, *Availability and Utilization of Solar Energy*, in the Dec. 1953 and Jan. 1954 HPAC Journal Sections appeared to be a good starting point. With refinements and modifications, this formed the basis for this design.

Early in the study, it appeared that a heat pump using the solar collector as a heat source would be the most promising solution, and further calculation and comparison confirmed this. So the heat pump became a basic part of the design conception. The more important reasons for this follow:

1) Since the heat pump delivers about 1.2 Btu for every Btu put into it by the collector, a smaller collector and storage can be used.

2) Since the heat pump can utilize low level energy, "concentrating" it to a higher temperature for use, the collector can be allowed to operate at temperatures approaching freezing. This is very important, since the collection efficiency and threshold level are a function of collector temperature, with efficiency approaching a maximum of about 85 percent when collection temperature is equal to ambient air (outdoor) temperature.

3) A high "use factor" for the collector is obtained because it can be used over a wide range of collec-



PIPING SYSTEM connects 830 sq ft flat plate solar collector with 7½ ton water chiller, 6000 gal water tank for heat storage, an evaporative water cooler, two circulating pumps, and floor and ceiling radiant panels. Automatic valves provide five basic circuits for various combinations of heating load and solar energy availability or cooling loads

TABLE 1—PRELIMINARY CALCULATION determined times of solar collector deficiency and approximate storage requirements

December 1955	Degree Days	Heat Required MBD	Langleys	MBD Available				Deficiency, MBD
				Collector	Heat Pump Collection Temperature			
				100F	85F	60F	40F	
		(1)*		(2)*	(3)*	(4)*	(5*)	
1	16	850	280	—	980			—
2	22	1095	270	—	—	1140		—
3	31	1460	164	—	—	—	1110	350
4	29	1380	92	—	—	—	620	760
5	36	1665	235	—	—	—	1590	75
6	38	1745	350	—	—	1860	—	—
7	38	1745	336	—	—	1790	—	—
8	37	1705	341	—	—	1814	—	—
9	39	1785	334	—	—	1780	—	—
10	35	1545	347	—	—	1840	—	—

*Equations used in calculations were derived as follows:

1) Heat Required MBD: Building heat loss, including outdoor air = 118,570 Btu per hr (based on 0 deg outside, 70 F inside) + 1000 × 24 hours per day × ratio deg days + 5/70 = 40. 6 × (deg days + 5).

2) Available MBD from collector, single glass cover, (Collector only, 100 F water leaving): = Langleys (horizontal surface) × 2.3 (factor −60 deg tilt to horizontal) × 3.69 Btu per sq ft × 830 sq ft of panel × 0.50 (efficiency, clear day, 75 F temperature difference between collection and outdoor average temperature) + 1000 = Langleys × (3.52)

3) (Using heat pump, 85 F collection): = Langleys (2.3) (3.69) (830) × 1.2 (mechanical increase in heat pump) × 0.50 (efficiency, partly cloudy day, 45 F temperature difference between collector and outdoor average temperature) + 1000 = Langleys × 4.22

4) (Using heat pump, 60 F collection, 0.63 efficiency): = Langleys × 5.32

5) (Using heat pump, 40 F collection, 0.80 efficiency): = Langleys × 6.76

tion levels, with or without the heat pump.

4) The heat pump unit can also be used for summer cooling, which gives it also a high "use factor." For these reasons, it appears not only desirable but economically necessary to use a heat pump with a solar heating system, particularly in the northern part of the country.

The solar heating system design procedure used for this building was basically one of day-by-day comparison of solar energy availability versus heating load. Heating load was calculated by conventional methods.

Solar energy received on a horizontal surface is recorded by the U. S. Weather Bureau in many principal cities. At the time this design was begun, records of three years were available for Albuquerque. Since a south facing vertical or sloping collector will receive considerably more radiation than a horizontal surface, this horizontal data must be extrapolated for the collector slope chosen. Messrs. Jordan and Threlkeld present data for this extrapolation based on actual values measured at the Blue Hill, Miss., weather bureau observatory. This site is the only place where radiation values are recorded on vertical as well as horizontal surfaces. The extrapolation should be valid for any part of the country when corrections are made for latitude and solar declination.

For this building, a collector with a 30 deg tilt from the vertical was chosen as being very nearly the optimum. It was then estimated that radiation received on this surface would be about 2.3 times that received on a horizontal surface. This is theoretical and is probably the biggest guess in the design. It is believed to be conservative, perhaps too much so, and recording of data to establish this factor accurately will be among the more important findings to be obtained from this building. Efficiencies for several different collector temperatures were estimated. The area of the solar collector was established to a great extent by the architectural design, although a ratio of collector area to floor area in the range of 1:4 to 1:6 seems satisfactory.

With these factors established, it was possible to proceed with detailed calculations, covering the months of December and January, which comprise the critical heating period in Albuquerque.

Factors were established to show the daily heating requirement with respect to degree days and solar energy "collectibility" for various efficiencies of the collector. By tabulating this data day by day, it was possible to determine the surplus or deficiency for each day and/or series of days. The greatest continuous deficiency discovered served as a basis for sizing the storage tank.

It should be noted here that solar collector area and storage tank size are dependent variables, within limits, for any given building. Optimum values will depend to a great extent on architectural and economic criteria.

A more detailed description of the design will be presented in a future paper, also operating data and conclusions as they become available.

TABLE 2—DETAILED CALCULATION determined deficiency and storage water temperature, based on 6000 gal storage and 50,000 Btu per F temperature change

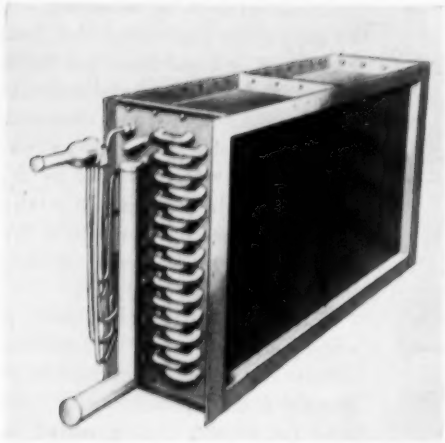
December	Storage Temp. F		Average Collector Temperature F			Collector Efficiency	Langleys	Collect MBD	Use MBD	Diff. MBD	Temp. Change
	Begin	End	Begin	End	Mean						
1	80.0	86.2	77.0	85.2	80.1	0.49	280	1160	850	+310	+ 6.2
2	86.2	84.8	85.2	81.8	82.5	0.45	270	1025	1095	− 70	− 1.4
3	84.8	70.4	81.8	67.4	74.6	0.55	164	720	1460	−740	−14.4
4	70.4	52.6	67.4	49.6	58.5	0.63	92	490	1380	−890	−17.8
5	52.6	49.9	49.6	46.9	48.3	0.77	235	1530	1665	−135	− 2.7
6	49.9	58.2	46.9	55.2	51.1	0.73	350	2160	1745	+415	+ 8.3

Expect Wide Use of System

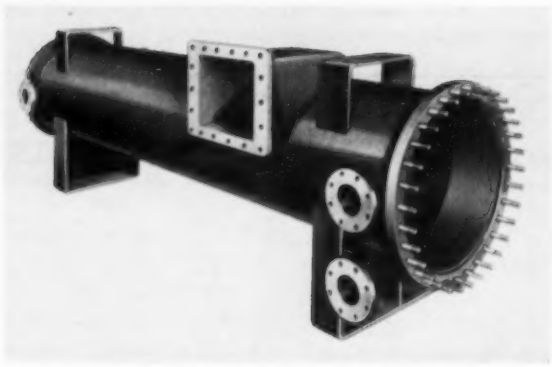
It is hoped that the information obtained from the operation of this building will be of interest and value in the design of future solar heated buildings. The author feels that this type of system will become increasingly important in small commercial buildings where complete year 'round air conditioning is desired, even in the more northerly latitudes.

The designers wish to express their appreciation to the many equipment suppliers who offered encouragement and suggestions.

The author wishes to thank Dr. James L. Threlkeld and Raymond Bliss for their advice and criticism. ⊣



1 FIN AND TUBE EVAPORATOR has a multitude of tubes through which boiling refrigerant circulates to remove heat from air



2 SHELL AND TUBE EVAPORATOR cools water flowing through its tubes by surrounding them with refrigerant

What Factors Affect Evaporator

Here's an engineering analysis of the factors affecting evaporator performance, with respect to air flow, surface area, pressure drop and other variables in refrigeration system design.

By W. C. Dackis

Manager,
Process Heat Transfer
The Trane Co.

AN EVAPORATOR is a heat exchanger in which heat is transferred from a hot medium to a liquid, causing the liquid to vaporize. More specifically, the function of the evaporator in the refrigeration system is to boil a refrigerant in order to cool air or water. It is fundamental that the temperature at which the refrigerant boils must be less than the temperature of the air or water.

The air conditioning evaporator can be classified both by construction and by operation.

Evaporators Are of Two Types

Two classes of evaporator construction are (1) the fin and tube or coil, and (2) the shell and tube type. The coil — Fig. 1 — is generally used when air is the medium being cooled. The warm air flows across the fins and surrenders its heat to the boiling refrigerant inside the tubes.

The shell and tube evaporator — Fig. 2 — is used to cool water which is then circulated through cooling coils. The refrigerant liquid surrounds the outside of the tubes and vaporizes as it absorbs heat from the water flowing through the tubes.

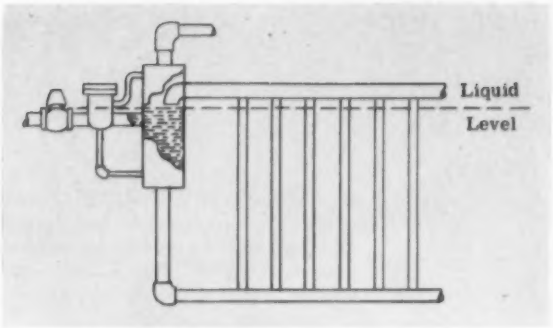
Classified by Operation

Classified by operation, evaporators are either of the "flooded" type or of the "dry expansion" type, depending on the means used to control the flow of liquid refrigerant.

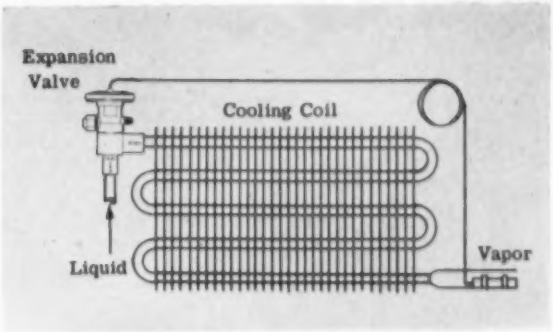
In the flooded evaporator — Fig. 3 — a float valve or other suitable control maintains the liquid refrigerant at a constant level. This level is usually kept high so that most of the interior of the surface is wet. As the liquid evaporates, the float admits more to the evaporator.

The "dry" or "direct" expansion evaporator — Fig. 4 — depends on an expansion valve to meter the flow of refrigerant to the tubes. The inside of the evaporator is filled with a mixture of liquid refrigerant and vapor. At the inlet side, there is mostly liquid. As the refrigerant flows through the tubes, more and more of the liquid is vaporized until nothing but vapor remains at the outlet. If the expansion valve allows insufficient liquid to enter the evaporator, it is soon vaporized and too much of the surface becomes ineffective. If too much liquid enters, it cannot be completely vaporized, and some of it will return to the suction line.

The distribution of refrigerant into a direct expansion coil is very important for successful operation. The distributor must deliver the same amount of flash gas and liquid to each circuit. In one type, the velocity of the refrigerant is reduced by an enlarged tube section ahead of the distributor proper — Fig. 5 — which



3 FLOODED EVAPORATOR has a float valve or other control to maintain liquid refrigerant at constant level



4 DRY EXPANSION EVAPORATOR depends on an expansion valve to meter the flow of refrigerant to the tubes

Performance Characteristics?

is provided with orifices for distributing equally to each circuit.

What Factors Affect Capacity?

The factors that directly affect direct expansion coil evaporator capacity are:

- Type of refrigerant.
- Temperature of refrigerant.
- Air velocity.
- Air temperature.

In addition, the refrigerant velocity and pressure drop must also be considered.

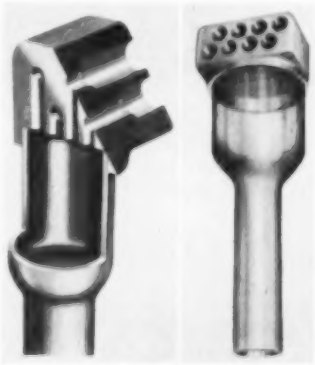
The type of refrigerant affects capacity of a given evaporator because of difference in thermal properties of various refrigerants, which is reflected in the heat transfer coefficient.

The refrigerant temperature not only affects the evaporator capacity but also can be the key to the most economical balance between coil surface and compressor in a system. Naturally, there are limits within which the refrigerant temperature must be selected. The maximum temperature is determined by the required leaving air temperature. The minimum temperature is determined by the economical balance between coil and compressor. The range is normally from 35 F to 50 F.

As a rule of thumb, an economical selection of a refrigerant temperature for a direct expansion coil is one which is 12 to 18 F below the desired leaving air temperature. The lower the refrigerant temperature, the greater the coil capacity. It should be remembered, however, that low refrigerant temperatures result in the possibility of frost formation on the direct expansion coil and inefficient compressor operation.

Capacity of the direct expansion evaporator varies in the same direction with air velocity. If the quantity of air handled is increased, capacity of the coil will increase. Evaporators usually are selected for air velocities in the range of 400 to 600 fpm. Moisture carryover and air pressure drop will determine what velocity to use.

Finally, capacity also varies with the air temperature. If the coil surface is dry, capacity will vary with the dry bulb temperature; if the surface is wet, capacity will vary with the wet bulb temperature. In any event, the higher the air temperature, the more capacity is available from the evaporator surface for a given refrigerant temperature.

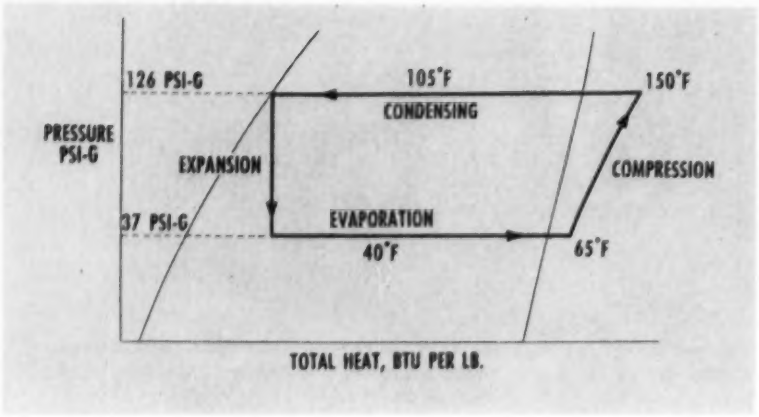


5 EQUALIZING LIQUID DISTRIBUTOR has enlarged tube section, with an orifice for each circuit

Average Coil Has 4 to 6 Rows

Before analyzing the evaporator in a system, there are two other points that should be mentioned. First is the economical coil depth or number of rows that should be used on the average air conditioning application. One should seriously reconsider any direct expansion coil selection using less than four rows, whether or not calculations show three rows to be required. On the other hand, a selection using more than six rows for the average application should also be questioned.

The second point in evaporator



6 PRESSURE-TOTAL HEAT CHART shows a typical compression-expansion cycle of the fluorinated hydrocarbon refrigerant No. 12. When boiled in the evaporator at 40 F, its pressure is 37 psig

selection is the problem of tube circuiting or serpentining. This is of extreme importance in order to achieve proper performance from a direct expansion coil. The purpose of serpentining is to divide the refrigerant flow through the coil into one or more circuits to maintain the correct refrigerant velocities and at the same time keep the pressure drop within desired limits. The number of tons of refrigeration handled per circuit, or circuit loading, has to some extent the same effect on a direct expansion coil as water velocity has on a water coil. In either case, low velocities will result in lower capacities.

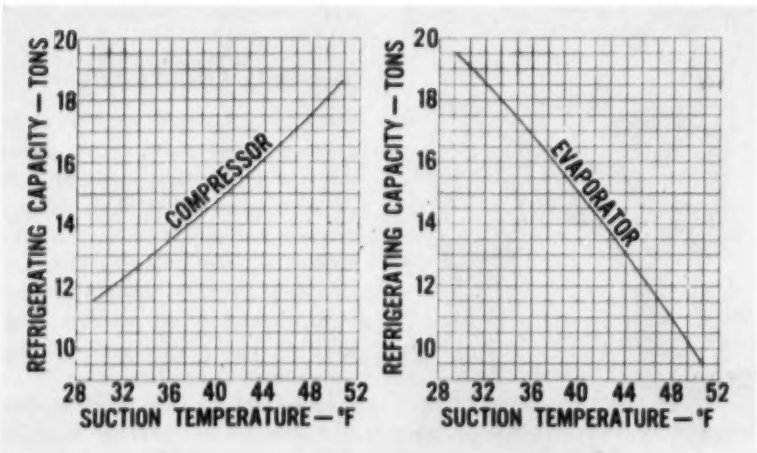
The refrigerant velocity must be high enough to "scrub" the walls of the tubes and break up the film of liquid refrigerant and oil that might adhere to them. It also must be sufficient to insure a continual movement of the oil that enters the evaporator. Velocity, however, must not be so high as to cause excessive pressure drop through the coil, thereby raising the average evaporator pressure and temperature. Range of pressure drop for direct expansion coils is from 0.75 to 6.0 psi, with refrigerant velocities of 1500 to 2500 fpm.

Study the Total System

Referring to the pressure-total heat diagram — Fig. 6 — it is seen that if fluorinated hydrocarbon refrigerant No. 12 is boiled in the evaporator at 40 F, the pressure will be 37 psig. This will also be the pressure at the inlet of the compressor assuming there is no pressure drop due to friction. In the compressor the pressure is raised from 37 psig to 126 psig, at which pressure it is discharged to the condenser. In the condenser the refrigerant gas will condense at the saturation temperature of 105 F, corresponding to the pressure of 126 psig. Because of the high pressure, the liquid is then forced to the expansion valve, where it is metered into the evaporator as required after expanding to 37 psig. The lower horizontal line represents the function of the evaporator on the pressure-total heat diagram.

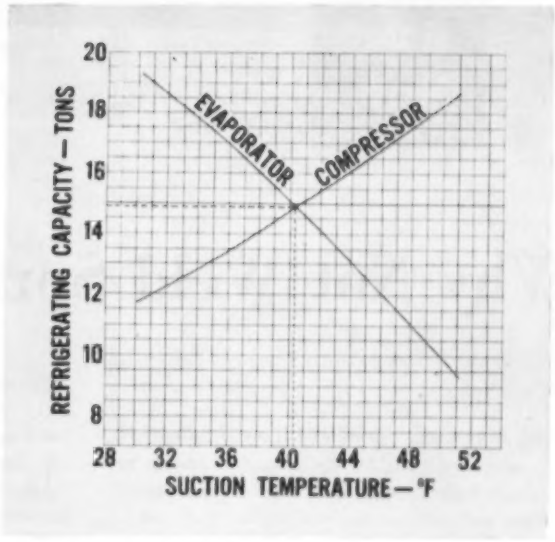
In order to study the effect of various factors on the performance of the evaporator in the system, use can be made of performance curves for both the compressor and the evaporator. See Fig. 7. The performance of each is shown graphically by plotting refrigerating capacity in tons against suction temperature, F. Manufacturers' direct expansion coil capacity tables are used in plotting the performance curve, which shows an increase in capacity with a decrease in suction temperature.

The compressor curve, which is also plotted from compressor capacity tables, shows the reverse relationship; that is, as the suction temperature decreases, capacity of the compressor also decreases. In the refrigeration system, therefore, identical conditions



7 COMPRESSOR AND EVAPORATOR PERFORMANCES are very different under identical conditions, as shown here. As suction temperature decreases, compressor capacity decreases but evaporator capacity increases

affect the two main components very differently. When capacity of the evaporator is increasing, capacity of the compressor is decreasing. It becomes apparent that there is one point where they both will have the same capacity, a point of balance. The actual capacity and suction pressure of a refrigerating system can be determined only by considering evaporator and compressor together.



8 POINT OF BALANCE, or that refrigerating capacity and suction temperature at which the system will operate, is at the intersection of the performance curves

Refrigerant Weight Important

In the subsequent observations it is important to note that the refrigerating capacity depends on the weight of refrigerant circulated.

The performance curves in Fig. 8 show capacity of an individual compressor and evaporator, separated and disconnected. If both curves are plotted on the same diagram, what happens when the evaporator is connected to the suction of the compressor can be determined. The intersection of the two curves represents the point of balance: the refrigerating capacity and suction temperature at which the system will operate. The refrigerating capacity of both compressor and evaporator are equal because with a steady suction the weight of refrigerant pumped by the compressor is exactly equal to the weight vaporized in the evaporator.

In the next article on the factors affecting evaporator performance, the author will discuss the effects of air flow changes, amount of surface, unequal multiple evaporators serving one compressor, suction line pressure drop, and the use of a back pressure control valve. ‡

850 Ton System Conditions Texas Factory Year 'Round

. . . added capacity more economical than insulation in this case

"AN AIR CONDITIONED PLANT that makes air conditioners" describes the Tyler, Texas, plant of Bryant Div. of Carrier Corp. The 200,000 sq ft structure is air conditioned year 'round. The 850 ton system employs a centrifugal compressor with an automatic suction damper. The compressor is driven by an 800 hp wound rotor motor with a six step speed control.

When the system was recently put into operation, the inside temperature was 20 F cooler than the 96 F outside.

The 10 year old plant is the first major industrial plant in east Texas to convert to complete air conditioning.

The potential "hot spots" in the plant were well charted in advance and proper compensation made for them in the location of air handling units.

The centrifugal compressor supplies chilled water to 15 air distribution units, which supply a total of 290,000 cfm. The get maximum air distribution with a minimum amount of ductwork, 13 of the air handlers were equipped with plenum boxes which distribute cooled air in all four directions. The remaining two air handlers have conventional duct runs. Each air distribution unit has its own thermostat controlling face and bypass dampers. This same control can be used to supply outside air.

The 15 air handling units replace 110 48 in. fans formerly used.

The plant is of monitor type construction. Low bays have an 18 ft ceiling. The high bays have a 23 ft ceiling. The air distributors are located in the high bays so that no floor space was lost.

The entire air conditioning installation was made while the plant was running at peak production. There was no loss of production attributed to the extra men and materials on the job.

Discharge plenums on the air distribution units were designed to produce air stratification in the high bays. Cool air is discharged downward from the units. Rising warm air is allowed to remain trapped in the bays. This practical physics application helped reduce the capacity requirement on the air conditioning system.

Consideration was given to insulating ceilings and walls, but it was found in this case that added capacity was the most economical solution. ‡

Question of the Month

Why Not Weld Sprinkler Piping?

THE QUESTION, *Why Can't Sprinkler Piping Be Welded?*, was asked previously in HPAC by a reader and is repeated here along with answers that have been received. Other comments and answers for publication will also be welcome.

"I would like to know why sprinkler piping systems are not welded when they are installed. We have been told that welding these pipe joints makes a fire hazard, but we are permitted to weld the steam lines only a few feet away.

"Perhaps another reason for not permitting welded joints in these systems is that a welded line might break during a fire. Or could it be that welded piping might have greater restrictions to the flow of water?

"I would like to hear why this situation exists and also if there is a possibility that it will be changed."—P. J. R.

•

The Standards referred to by the several correspondents below are those developed by the National Fire Protection Association and published by them and also by the National Board of Fire Underwriters and the Dominion Board of Insurance Underwriters, all under the same number and title. Copies are available from the National Fire Protection Association at $1.00 and from the National Board of Fire Underwriters in New York, Chicago, and San Francisco.

•

Any Changes in Regulations Would First Have to be Recognized by the NFPA

THE LIMITS to which welding may be used in the installation of automatic sprinkler systems are defined in Pamphlet No. 13 of the National Board of Fire Underwriters, titled, "Standards for the Installation of Sprinkler Systems as Recommended by the National Fire Protection Association." As the standards are first recommended by the NFPA before being adopted by the NBFU, I would assume that any change in these regulations would have to be recognized through the National Fire Protection Association.

DAWSON POWELL
Technical Editor
Grinnell Co.
Providence, R. I.

Bureaus Make the Rules; Industry Should Follow Them, Not Object

THIS MATTER has been discussed in the sprinkler industry for some time. Nevertheless, almost everybody concerned with sprinkler piping follows the standards for installation as published in Pamphlet No. 13 of the National Board of Fire Underwriters. As the present standard indicates, "welding of joints in risers and large feed mains may be allowed in special cases," subject to permission of the authority having jurisdiction.

As to the feeling "that the weld might break during a fire," I know of no basis for this. I believe that the objections to the complete welding of sprinkler systems have come principally from the bureaus and insurance interests in the first place. It seems appropriate for people in the industry to acquiesce in the restrictions rather than to object to them. One basis for bureau objections to welding is the fire risk involved in field welding. The argument has also been advanced that a welded sprinkler system is less flexible when it comes to making changes occasioned by the addition or removal of partitions, furred ceilings, etc.

I think also that most sprinkler engineers and contractors feel that economically there is nothing to be gained by welding sprinkler systems especially on the smaller size pipe and hence do not feel strongly towards recommending welding.

LOUIS K. BERMAN
President
Raisler Sprinkler Div.
Raisler Corp.
New York, N.Y.

Lack of Protection During Sprinkler Installation Is Case Against Welding

THE POSITION of the NFPA concerning the welding of sprinkler piping is primarily based upon the danger of the start of fire by reason of sparks from welding opera-

tions. This statement applies only to welding conducted on the job and not to shop welding of prefabricated sections.

It should be noted that sprinkler piping is generally installed in locations where there is a substantial amount of combustible material present and where the sprinkler system is considered essential in safe guarding life and property against fire.

During the period when the sprinkler system is being installed, there is no protection available and the absence of such protection makes it particularly important not to run the chance of a start of a fire by sparks from any cause.

Our provisions in the NBFU Pamphlet No. 13, "Standards for the Installation of Sprinkler Systems," give our official recommendations on this subject.

ROBERT S. MOULTON
Technical Secretary
National Fire Protection Association
Boston, Mass.

READER ASKS—

"How Many Man-Hours for Heating, Piping, and Air Conditioning Installation Work?"

"How many man-hours may be estimated for cutting, threading, welding, and installing piping of various sizes? I am interested in obtaining this information for modification of heating, piping, and air conditioning systems in an industrial plant.

"Also, I would like to have man-hour values that have been established for insulating piping and assembling and erecting ductwork."
—W.G.N.

• *YOU ARE INVITED to contribute a question for publication or an answer to a published question. Write: The Editors, Heating, Piping & Air Conditioning, 6 N. Michigan Ave., Chicago 2.*

37 Through-the-Wall Units Condition Apartments

INSTALLATION of 37 room air conditioners through-the-wall in a new three-story apartment building in Miami was made recently for $10 to $12 each, according to Amana Refrigeration, Inc.

The units, installed directly below windows and flush with inside walls, protrude only 17 in. outside the building. There is a 1½ hp unit in each living room and a ½ or ¾ hp unit in every bedroom.

As the building's 10 in. thick walls went up, the cabinets of the units were set in place and then weather-sealed with plaster and cement. Later, the air conditioning units were easily placed in all of the outer cabinets, plugged in, and ready for use.

The installation was made by Sevane Air Conditioning Co. ≠

New Impeller Lab Has Largest Air Flow Test Range

. . . *from* 15 *cfm to* 20,000 *cfm*

A NEW AIR IMPELLER engineering laboratory — the most extensive of its kind — was recently completed at the Torrington Manufacturing Co.

In addition to seven specially designed test chambers and other flow measuring apparatus, the laboratory includes facilities for testing endurance, noise, vibration, shock and corrosion resistance. Designed and operated by the engineering staff of the company's air impeller division, the laboratory will be used both to develop new air impellers and to test commercial air moving appliances and equipment.

The laboratory's seven calibrated nozzle test chambers conform to National Association of Fan Manufacturers pressure test codes and cover an air flow testing range from 15 cfm to 20,000 cfm, the widest flow measuring capacity available today in a single facility. The test chambers are equipped with from three to nine nozzles so that accurate results may be obtained from the wide open to the shutoff condition for any impeller unit by selecting proper combinations of active nozzles.

An experimental shop is maintained within the laboratory for making models, adapting prototype air moving units to the test apparatus and for altering prototypes as required. ≠

DOORS STAY OPEN, inviting customers into cool comfort of this new supermarket, which has the latest features in food merchandising. Cold water from a 180 gpm well is piped to coils in three 30 ton, 12,000 cfm air conditioning, heating, and ventilating units in attic. Ducts deliver air to ceiling diffusers throughout main area

Open Door System Conditions Large Supermart

. . . uses 100 percent outdoor air and well water

EVEN on the hottest summer days, the new 27,000 sq ft Hinky Dinky supermarket in Omaha has been able to keep its doors wide open to customers.

The air conditioning system uses 100 percent outdoor air. This allows doors to stay open, inviting customers inside where it's cool, removes stale air from the building continuously during store hours, and builds up a positive air pressure inside the building to prevent the infiltration of heat, dust and moisture and provide adequate makeup air for exhaust fans.

The air conditioning, heating, and ventilating units consist of three 30 ton, 12,000 cfm units in the attic space directly above the sales area. Cold water from a 180 gpm well is piped to an all copper blast coil in each unit. Outdoor air is taken into a central plenum chamber, filtered, cooled, and dehumidified in the coils, and delivered through insulated ducts to ceiling diffusers throughout the main floor area. Blowers operate constantly during the day to maintain circulation and ventilation; at night they automatically revert to intermittent operation to save power. Three exhaust fans total 5000 cfm in capacity.

A special thermostat keeps the store cool through the night, helping to preserve fruits and other produce and also reducing the load imposed on the open refrigerated cases. A certain percentage of the cooled air in the sales area is forced to the stockrooms in the rear of the store, thus giving considerable secondary cooling to the service areas without adding to the initial or operating cost.

The system also provides heating and ventilation in the winter. Two central gas fired boilers provide hot water, which is supplied to the same air handling units for heating as are used for cooling. Whenever the store temperature drops below a certain point, a special changeover thermostat operates two large changeover valves which transfer the system from cold to hot water. At the same time, a bank of four hot water circulating pumps is automatically put into operation. Even in winter, the blowers operate at all times during the day for circulation and ventilation, and the room temperature is controlled by regulating the flow of hot water to the coils and air handling units.

It is a wellknown fact in market management that if the store were kept warm enough for the personnel working without coats, it would be too warm for customers who come in from outside on a cold day, wearing heavy clothing. This dilemma was solved by installing a radiant heating panel in the concrete floor. This panel runs under the floor of the cashier's office, manager's office, checkout area, public rest rooms, and meat packaging rooms, and is controlled by a second thermostat attached to one of the checkout stands. In this way the store temperature can be reduced 5 to 10 F, resulting in customer comfort and a considerable saving in fuel cost. The stockroom area is heated by three suspended hot water unit heaters, operating entirely on their own independent circuit.

Another unusual feature, which saved a considerable amount of money, is an automatic water supply system for the refrigeration condensers serving the store's walk-in coolers and open display cases.

During the cooling season, the well water flows into a large storage tank after it has passed through the air-conditioning coils. The water is then drawn from this tank by a large booster pump which delivers the water to the refrigeration condensers. If for any reason the water supply to this storage tank is cut off, a motorized valve automatically opens and admits city water into the system. If for any reason the booster pump fails to operate, a standby pump automatically goes into operation and a signal light flashes on the control panel.

In winter, the well water bypasses the air conditioning coils and flows directly into the storage tank. During this season, the well pump is automatically controlled by float switches on the tank.

Glass area totals 1600 sq ft. Roof construction is steel deck, with 1½ in. insulation. Walls are face brick, with concrete block back-up. Design occupancy is 450 to 500 persons. The systems were installed by Hastings Air Control, Inc. ≠

Tear out along this line.

Fuel Oil Systems With Rotary Pumps

By M. K. Bond
Mechanical Engineer
De Laval Steam Turbine Co.

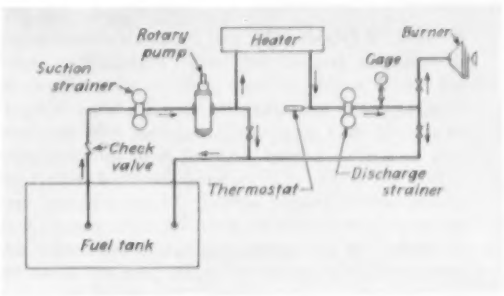
SHOWN in the following are a number of practical fuel oil systems with rotary pumps, ranging from a simple to more complex systems for small to large boiler operations.

At normal temperatures No. 6 fuel oil, or Bunker C, is a heavy, slow flowing oil. To make it combustible the oil is atomized in the burner so that air, which is necessary for combustion, can quickly surround the minute oil globules.

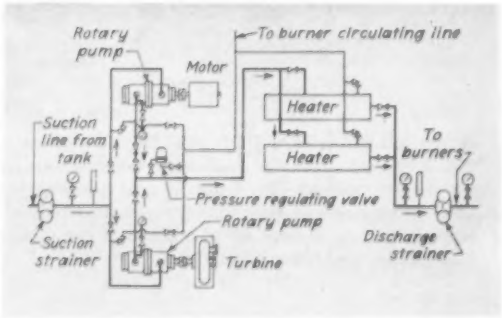
A rotary pump combines the rotary motion of the centrifugal pump with the positive pressure characteristics of the reciprocating pump. As a positive displacement device, the rotary pump delivers a given quantity of fluid with each revolution. There are six basic types of rotary pumps, but the pumping characteristics of each are essentially the same. One type is the rotary screw type, which permits higher rotative speeds because of lower fluid speeds that result from its axial flow characteristic.

The use of strainers, stop checks, relief valves, control valves, and other devices improve the operation of the system and make it as selfoperative as possible. Care in selecting the proper equipment and in applying manufacturers' instructions for its installation will pay off in trouble free operation.

Trouble is often encountered in a system because of air leaks that result from improper pipe joints in suction lines or in packing valves or strainers. When a pump is to operate under negative pressure, it is important that the simple rules of good installation be observed. When suction lift is a factor in a system, the pumps should be as close as possible to the oil tank to prevent vapor lock and excess suction lift. Air leaks are critical and cause cavitation when suction lifts are encountered.



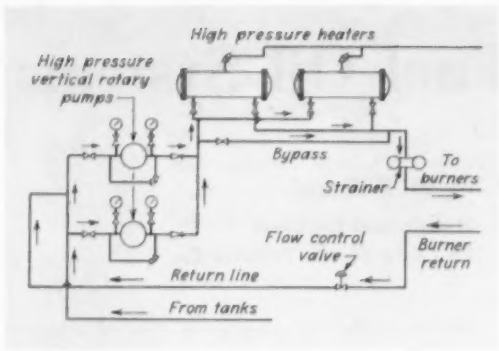
1 BASIC SYSTEM of fuel handling from tank to burner uses pump and heater to increase pressures and temperatures. The pump also pumps oil from the tank, which in most cases is buried below ground surface. The pump in this system can handle pressures up to 150 psig at 120 to 130 F. Valves for bypassing the heater are not shown in this basic diagram, although this would be good practice. Also, a relief valve should be provided at the pump discharge, not shown in the diagram. This system is applicable for industrial boiler operations where forced shutdowns will not affect production or other important processes

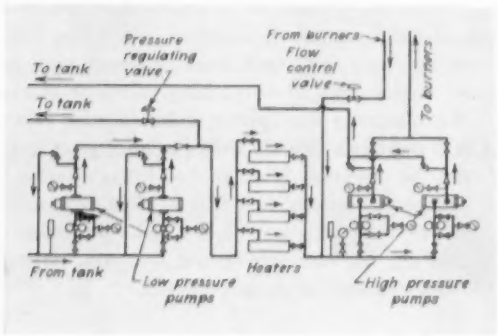


2 DUPLEX SYSTEM duplicates each important piece of equipment. It has a built-in standby system to insure continuous service against system equipment failure or other emergencies. An adjustable diaphragm valve provides automatic pressure regulation. Pumps in this system can handle pressures up to 350 psig at 120 to 130 F. One of the pumps is motor driven and the other steam turbine driven. Preference for this system, or for one in which both pumps are either motor driven or turbine driven, depends upon plant conditions. However, a steam driven prime mover for one of the pumps provides insurance against power failures. The item, "To burner circulating line," may also be labeled "To tank"

3 HIGH PRESSURE BURNER SYSTEM with recirculation maintains constant pressures at the burners by actuated control valves. Development of the "wide range burner" increased pressures at the burner tips. This required a high pressure fuel oil service system as shown here. Also included are special type heaters that can withstand these higher pressures. This is one of the first systems devised to handle wide range burners. Pumps in this system handle pressures up to 1150 psig at 120 to 220 F.

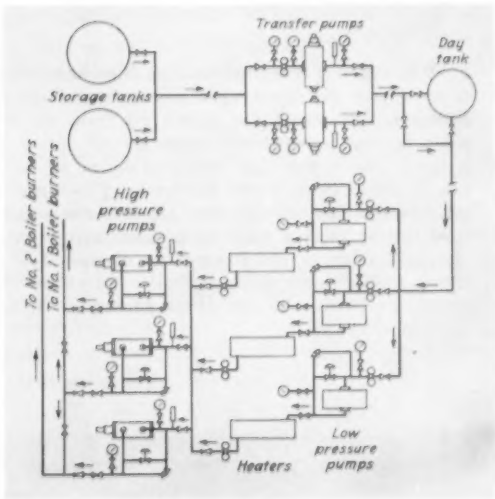
Inlet oil temperatures to the pump will vary with recirculation demands, which are determined by quantity of oil being burned. Higher rate of recirculation will result in higher inlet temperatures. When rate of recirculation is low, more oil will be drawn from the tank and inlet oil temperatures will be close to the temperature of the oil in tank, which is usually around 120 F

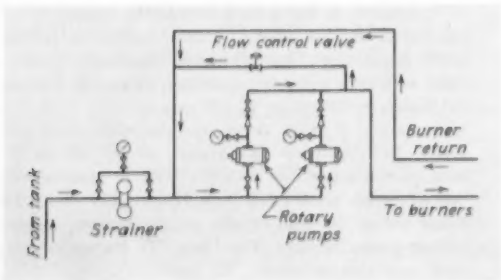




4 MODIFIED HIGH PRESSURE SYSTEM for a wide range burner service is designed to avoid the use of special type heaters for economy reasons. Low pressure heaters are used instead. This is made possible by adding low pressure pumps on the intake side of the heaters, and high pressure pumps are moved to the hot or discharge side of the heaters. Low-head pumps pick up the oil from the tanks and pump it through the heaters to the high pressure pumps at a positive inlet pressure. The low pressure pump is of a larger size so that the high pressure pump will not be starved; thus a positive pressure will exist at the inlet side of the high pressure pump. High pressure pumps supply oil directly to the wide range burners. The discharge pressures of the low pressure varies from approximately 150-250 psig at 120 to 130 F, and of the secondary or high pressure pumps from 900 to 1150 psig at 200 to 220 F

5 LARGE QUANTITY OIL SYSTEM is for boiler operations that require very large quantities of oil. The fuel oil is stored in large tanks at some remote point from the boiler room, usually built above ground surface because of their size. Oil is pumped from this storage tank to a much smaller day tank with sufficient capacity to provide oil for 24 hr burning service. The day tank is usually below ground surface. Transfer pumps are required in this system to pump oil from storage tank to day tank. The low pressure pumps in the burner service system handle pressures up to 250 psig at 120 to 130 F, and the high pressure pumps, 1000 psig at 200 to 220 F





6 AUXILIARY START-UP SYSTEM shown here uses No. 2 fuel oil. Since No. 2 oil has a low viscosity, heaters are not required. This system is used for initial start-ups, or for start-ups after forced shutdowns. Similar oil burning start-up systems are also found in many pulverized coal burning boiler installations

HEATING, PIPING & AIR CONDITIONING
AMERICAN SOCIETY OF
HEATING AND AIR-CONDITIONING ENGINEERS
Journal Section

The object of the Society is to advance the arts and sciences of heating, ventilating, cooling and air conditioning, and the allied arts and sciences, for the benefit of the general public, to encourage and conduct scientific research, and to cooperate with other organizations having the same or similar objectives.

Air Flow in Free Convection over Heated Bodies

By T. F. Hatch* and D. Barron-Oronzco**, Pittsburgh, Pa.

This paper is the result of research sponsored by the AMERICAN SOCIETY OF HEATING AND AIR-CONDITIONING ENGINEERS in cooperation with the Graduate School of Public Health, University of Pittsburgh, Pittsburgh, Pa.

SUMMARY — The material in this paper can be used as a basis for determining exhaust ventilation requirements for hot processes in industry. Reported are the results of a laboratory study of free convection flow past heated bodies, the objective of which was to relate the magnitude of flow at various distances above the hot body and, more particularly, to its rate of convective heat release. It was desired to express the relationship in the form of a general equation by means of which the design engineer could estimate the cross-sectional dimensions, velocity, and overall rate of flow of the rising air stream at any desired distance above a given piece of hot process equipment where an exhaust hood was to be placed.

THE RATE of local exhaust ventilation required for the capture and removal of atmospheric contaminants released by industrial processes is primarily determined by the magnitude of air flow away from the process rather than by characteristics of generation and release of the contaminant itself. This is because fine dust particles, fumes, vapors and gases given off by the process are not dispersed *through* air†. They mix intimately with the air immediately around the point of release and are carried away only by air movement. Thus, the stream of air flowing past the point of release picks up the contaminant and it is this stream of contaminated air which must be captured and removed. From this it follows that the starting point in the determination of the local exhaust ventilation requirement for a given process is an identification of the source or sources of air motion which are operating around the process, the determination of the patterns of air motion, such as direction and velocity of flow, and estimation of the overall rate of flow of the contaminated air away from the process.

In certain categories of industrial processes, the sources of the troublesome air motion are inherent in the process itself. The forces operating to create the air flow are well identified and can be related to measurable characteristics of the process. If such relationships can be developed in systematic physical and mathematical terms, the design engineer is thereby provided with important information to guide him in his determination of the local exhaust ventilation requirements.

An important group of industrial processes which inherently create air motion are those involving release of heat. The process equipment operates at an elevated temperature and strong vertical convection currents are created. Any contaminant given off by the process will be incorpo-

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**Department of Occupational Health, Graduate School of Public Health, University of Pittsburgh and now Direccionde Hygiene Industrial, Mariano Escobedo #20, Mexico, D.F.
†Relatively coarse particles, released with high initial velocity, are projected through air but those of principle hygienic interest (<10 u) are not. Vapors and gases are also dispersed through air by molecular diffusion, but the diffusion velocity is relatively low compared with normal velocities of air movement even in "still air."
For presentation at the 65rd Annual Meeting of the AMERICAN SOCIETY OF HEATING AND AIR-CONDITIONING ENGINEERS, Chicago, February 1957.

rated into the rising stream of heated air and be dispersed with it‡. Local exhaust ventilation, such as by the common canopy hood, must be applied at a rate in excess of the rate of convection flow to ensure successful control of the contaminant.

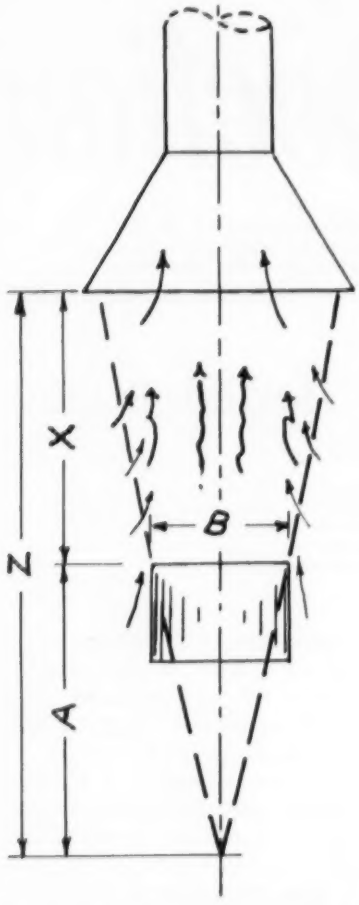


Fig. 1—Path of expanding stream of heated air, showing relation to the theoretical *point source* and to distance, Z

Physical Relationships

As a buoyant stream of heated air rises it acts like a jet and, by turbulent mixing, draws cooler surrounding air into the rising stream. In consequence, the volume rate of flow increases with distance above the heat source. Since the amount of heat in the stream remains constant, the excess temperature above the ambient level decreases as distance increases and the velocity decreases. The cross-sectional dimensions of the stream expand as the heated air rises. When the excess temperature drops below a certain value the buoyancy of the air is used up by turbulent mixing and the upward direction of flow is destroyed. The rising stream terminates by complete mixing with the ambient air.

Despite the practical importance of free convection air flow in many situations involving heat transfer, the relationships involved in this phenomenon have received very little attention by physicists and engineers. The problem was dealt with by Schmidt[1], who derived a mathematical expression from theoretical considerations and confirmed by some limited experimental data. Sutton[2] has considered the problem on a theoretical basis, particularly in respect to the stream of hot gases issuing from a chimney. This has great practical value in problems of community air pollution and is of interest here since it should have equal application to the free convection flow created by a hot body.

On the basis of mixing theory, Sutton derived the following expressions for the change in stream velocity and in radius with distance above a hypothetical *point source* of heat:

$$W = W_1 Z^{M/3} \quad \ldots\ldots(1)$$

$$W_1 = [7g/(3\pi C_p \rho T_a C)]^{1/3} h^{1/3} \quad (2)$$

$$r = 1.5 CZ^{M/3} \quad \ldots\ldots(3)$$

where

W = stream velocity, feet per second.
W_1 = constant, for given rate of heat output, h.
Z = distance above *point source*, feet.
h = convective heat output from source (heat carried away by rising stream) (Btu/sec).
g = gravitational constant, 32.174 ft per (sec)(sec).
C_p = specific heat of air at constant pressure, Btu per (pound) (Fahrenheit degree).
ρ = density of air at ambient temperature and pressure, pounds per cubic foot.
T_a = temperature of ambient air, Fahrenheit absolute.
C = coefficient of mixing by eddy diffusion.
r = radius of rising stream of heated air, feet.

From an analysis of Schmidt's experimental data, Sutton concluded that the exponent, M, has a value of 1.75 (Schmidt took $M = 2.0$) and from his own work on the dispersion of gases with distance from a point source, he found $C = 0.17$ ft$^{1/6}$. In English units, converting velocity to feet per minute, V, and convective heat flow to the common form, H, Btu/hr:

$$V_1 = [(7 \times 32)/(3\pi \times 0.25 \times 0.075 \times 530 \times 0.17)]^{1/3} (H/3600)^{1/3} = 0.16 H^{1/3}$$

$$r = 1.5 \times 0.17 Z^{0.58} = 0.255 Z^{0.58}, \text{ ft} \quad \ldots\ldots(4)$$

$$A_s = \pi r^2 = 0.203 Z^{1.16}, \text{ sq ft}$$

$$V = 60 \times 0.16 H^{1/3} Z^{0.42} = 9.6 H^{1/3} Z^{0.42}, \text{ fpm} \quad \ldots\ldots(5)$$

and, since

$$Q = VA,$$

where

Q, in cfm = $1.95 H^{1/3} Z^{1.58}$
H = Btu per hour
Z = feet.

Here, it is noted that the rate of flow of the rising stream at distance Z above the hypothetical point source is proportional to a constant, to the 1/3 power of the convective heat output and to the 1.46 power of the distance. Since a point source of heat release was assumed, no physical dimensions of the heated body appear in the equation.

Application of Sutton's Equation to Local Exhaust Design

In practical application of local exhaust ventilation over hot process equipment, the heat source has real dimensions and the contaminated air must be captured within a relatively short distance above the process in order to keep the required rate of ventilation at a minimum and to minimize opportunity for spread of the contaminant into the general atmosphere. A hot body of real size may be treated theoretically as a point source of heat beyond a certain

‡The heat itself may be considered an atmospheric contaminant and local exhaust ventilation is frequently applied to hot process equipment in order to capture and remove the heated air before it escapes into the surrounding work space.

[1]Exponent numerals refer to References.

minimum distance but Sutton's equation requires experimental verification to demonstrate its practical usefulness within the relatively short distances at which local exhaust hoods are applied above hot process equipment. This was the primary objective in the present study.

For purposes of this study, the equation has been rewritten to give a linear relationship, the distance Z being expressed as: $Z = A + X$ where A is the distance from the hypothetical point source of heat to the top surface of the hot body and X is the distance from the top surface to the level where local exhaust ventilation is to be applied (see Fig. 1). Then,

$$(Q/H^{1/3}) = K(A + X)^{1.46}$$
$$(Q/H^{1/3})^{1/1.46} = K^{1/1.46}(A + X) \quad \ldots(6)$$

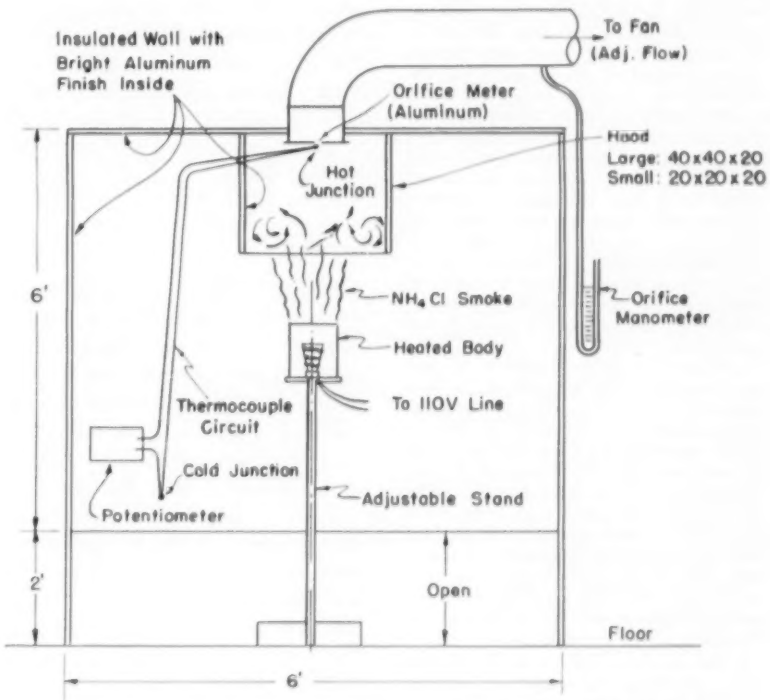
Equation 6 is in the form of a linear relationship and should give a straight line on an arithmetic grid when $(Q/H^{1/3})^{1/1.46}$ is plotted against X. The slope of this line will give the value of the constant, $K^{1/1.46}$ and the intercept at $X = 0$ should equal $AK^{1/1.46}$.

Thus, a ready means is at hand for testing the application of the equation within short distances, X, from experimentally determined values of Q *vs.* X for various values of heat output, H. One may also determine the influence of the dimensions of hot bodies of different sizes upon the value of A or other influence upon the relationship. It is to be noted in this connection, that the radius of the rising stream increases with the 0.88 power of distance. If, at the top surface of the hot body, the rising stream is assumed to have the same cross-sectional dimension as the body B, then, from Equation 4:

$$A = 2.15\ B^{1.14}$$

Experimentation

The physical facilities for determining the variation in Q with X are shown in Fig. 2. The experimental hot body, consisting of an electrical resistance heater inside a metal can, was mounted on an adjustable stand axially below an exhaust hood extending down from the ceiling of an insulated cubicle placed in the center of a 24-ft square laboratory. The exhaust hood was connected to a variable output fan, the air flow being measured by a sharp-edge orifice placed at the inlet to the exhaust pipe with the orifice head indicated by a water manometer in the standard manner. A copper-constantan thermocouple circuit was provided with the hot junction placed just below the orifice and the cold junction located at a remote point within the cubicle. From the temperature rise in the air stream above the ambient temperature thus measured, and the rate of air flow through the orifice, the rate of convective heat output by the heated body was calculated.



Aluminum lined enclosure and arrangement of heated body, receiving hood and air flow meter for determining convention air flow in relation to distance above heated body.

Fig. 2—Experimental setup for determining air flow by free convection over a heated body

Air entered the cubicle at a negligible velocity through the 2-ft high opening above the floor. Disturbing crosscurrents within the cubicle were minimized by tight walls which also provided thermal insulation to make the cubicle temperature relatively unresponsive to sudden changes in the laboratory temperature. In addition, the walls and ceiling of the cubicle and the interior of the hood were lined with bright aluminum foil to minimize heating of these surfaces by radiation from the hot body. Since the body operated with a surface temperature of several hundred degrees, the radiant heat output was at least twice the output by convection. Without the aluminum lining, there would have been significant heating of the walls with the consequent development of disturbing down and cross-drafts in the experimental room.

Measurements were made in the following manner for a given heated body mounted on an adjustable stand:

1. The rate of air flow through the hood was first set to a desired level by the choice of a proper size orifice and adjustment of a blast gate in the duct to give the appropriate manometer reading.

2. The stream of rising hot air was made visible by volatilizing a quantity

of ammonium chloride on the body to produce smoke.

3. With Q and the heat input to the body kept constant, the distance X was then varied up and down until the distance was found where no smoke was seen to escape outward under the edge of the exhaust hood. To test this end-point sensitively, a strong light beam was directed parallel to and just below one edge of the hood. There was no other illumination within the cubicle and the observer, standing quietly in a position opposite to the illuminated edge, could note the direction of travel of the smoke. When the end-point was reached, he could detect a rather stable volume of smoke-filled air filling the hood with a fairly well defined lower boundary just at the bottom edge of the hood. It was necessary for him to remain quiet since the smallest crosscurrent tended to upset the flow pattern and cause momentary escape of smoke. For each setting of X it was necessary to observe the performance over a sufficient period of time to allow the system to stabilize and the thermal gradient to become steady.

4. When the proper distance X had been determined, the temperature rise was measured. It was found that the addition of ammonium chloride smoke to the air stream increased the convective heat output and thus disturbed the Q *vs.* X relationship. In order to minimize this source of error, the amount of ammonium chloride added in each test was standardized and kept approximately constant. Furthermore, the thermocouple reading was not taken until after the chloride had completely volatilized and the air stream was clear.

5. For a given body with fixed heat input, the foregoing series of steps was repeated for different values of Q and the corresponding values of X determined over a range from a fraction of the hot body diameter up to 5-6 diam distance between the heated body and the hood.

6. Four different sizes of heated bodies were studied: (a) 5½-in. diam × 6 in. long cylinder, observed with axis both vertical and horizontal; (b) 5½-in. diam × 9 in. long cylinder, observed with axis both vertical and horizontal; (c) 8-in. diam electric hot plate (laboratory model) with hot surface horizontal and operated at 3 different rates of heat input: low, moderate, high; (d) 12-in. diam × 5¼ in. high pan placed upside down on metal plate.

The method used here for determining Q is not an absolute one. Since the hot body, in most of the tests, had a circular cross section, the rising stream was also circular and it varied in diameter with distance above the body. Consequently, the stream did not correspond to the hood either in shape or size. Moreover, the rising stream has a high center-line velocity compared with its velocity at the outer boundary and this causes turbulence within the hood and encourages momentary escape of smoke at certain points around the edges of the hood despite the fact that the overall flow is adequate. A better, although impractical arrangement would have been a round hood of varying diameter, adjusted to the proper stream diameter at each distance X. To gain some idea of the influence of the hood upon the determined value of Q, tests were run with 2 sizes of hoods: 20 × 20 × 20 in. deep and 40 × 40 × 20 in. deep.

Results

In Fig. 3 the experimental data are presented in the form: $(Q/H^{1/3})^{1/1.46}$ *vs.* X on arithmetic coordinate paper. A satisfactory linear relationship is demonstrated in each case with a positive value shown for the Q/H function where $X = 0$, as on would expect from Equation 6.

Q as a function of $H^{1/3}$. The plotted points for the laboratory hot plate operated at 3 different rates of heat input, shown at C in Fig. 3, obviously fall on a single trend line. The 3 rates of heat input were substantially different and, for a given distance, X, resulted in different values of Q. The ratio, $Q/H^{1/3}$, however, is constant for any particular distance X, as predicted by Equation 6. Further evidence in support of the Q *vs.* $H^{1/3}$ relationship is seen in the other experimental data. Although the electrical input to the test body was not deliberately varied, the convective heat output did vary from one test to another, owing to minor variations in air currents in the cubicle and because of the influence of the ammonium chloride smoke upon this component of the total heat output. Plotting $Q/H^{1/3}$ against X rather than Q *vs.* X definitely reduced the scatter and brought experimental points close together along the trend line.

The dependence of Q upon $H^{1/3}$ is a most important practical finding since it means that the required rate of exhaust ventilation for the capture of contaminated air over hot-process equipment does not increase remarkably with heat output. In practice, it will be difficult to estimate the convective heat output from many processes, but, in view of this relationship between Q and H, an error in the estimate of H will not be too serious. For example, a two-fold error in H changes the calculated value of Q only 27 percent.

Q as a function of $(X + A)^{1.46}$: The demonstrated linear relationship in Fig. 3 confirms the exponential increase in Q as the distance, Z, from the hypothetical point source of heat, increases. If the exponent had a value other than 1.46, the plotted points in Fig. 3 would have followed curved rather than straight lines.

Agreement with constant, W_1: A constant appears in Equation 6 which is made up of certain physical constants for any given set of environmental conditions (g, C_p, ρ, T_a, C) but does not include any variables related to the dimensions of the heated body. With Q expressed in cubic feet per minute, heat output in Btu per minute and X in inches, as employed in the analysis of the data, this constant has a value of 0.198 and $K^{1/1.46} = 0.33$.

From the slopes of the lines in A, B, and C in Fig. 3, the four bodies with circular cross-sectional slopes, the values of $K^{1/1.46}$ and of K shown in Table 1 are obtained.

Table 1—Values of $K^{1/1.46}$ and K for Four Bodies with Circular Cross-Sectional Slopes

Body	Dimensions, In.		$K^{1/1.46}$	K
	Diam	Height		
Vertical cylinder	5½	6	0.24	0.124
Vertical cylinder	5½	9	0.25	0.132
Hot plate	8		0.20	0.100
Pan	12		0.20	0.100

Since the 2 cylinders with horizontal axes presented asymmetrical shapes (D and E in Fig. 3), they were not expected to conform exactly to Sutton's relationship for a theoretical point source and are not included in the analysis.

The experimental values of K are smaller than the predicted value of 0.198. Error may reside in the ex-

perimental procedure (in which the shape and size of the exhaust hood was assumed to have no influence upon the Q *vs.* X relationship), or in the calculation of H from Q and Δt. Another possible source of error is in the use of an improper value of C, the coefficient of eddy diffusion. Sutton's value of $C = 0.17$ ft$^{1/8}$ was obtained from observation of the diffusion of chemical warfare smokes in the atmosphere over grass-covered plains. In the present experiments, in order for K to agree otherwise with W_1, the value of C would have to be 0.13 for the two 5½-in. diam vertical cylinders and 0.11 for the hot plate and 12-in. diam pan. Considering the greater stability of the atmosphere within the experimental cubicle compared with the general atmosphere, such decrease in C is not unreasonable.

Table 2—Values of A Calculated from Experimental Data on Four Bodies in A, B, and C of Fig. 3

Body	Dimensions, In.		Value of A, In.		
			From Tests		
	Diam	Height	Small Hood	Large Hood	Predicted
Vertical cylinder	5½	6	9.6	8.7	10.7
Vertical cylinder	5½	9	7.3	14.0	10.7
Hot plate	8		12.5	17.5	16.2
Pan	12		—	26.0	24.2

Relation between A and diameter of heated body: The values of A, calculated from the experimental lines for the circular bodies in A, B and C in Fig. 3, are listed in Table 2 together with the predicted values, according to the relationship:

$$A = 2.15\ B^{1.16}$$

where

B = diameter of hot body.

The predicted value of A is based upon the assumption that the stream of rising air has an initial diameter equal to that of the hot body itself. This is not exactly true since there is a tendency for the rising stream to contract (somewhat like the vena contracta in fluid flow through an orifice) just above the top surface of the body.

There is fair agreement between the experimental and calculated values of A, the agreement falling between the values for the larger and smaller hoods. Undoubtedly, this reflects an error in determining the value of Q corresponding to different values of X and the influence of hood shape and size upon this relationship.

pattern should approach that from a line source of infinite length; whereas at greater distances, the flow should

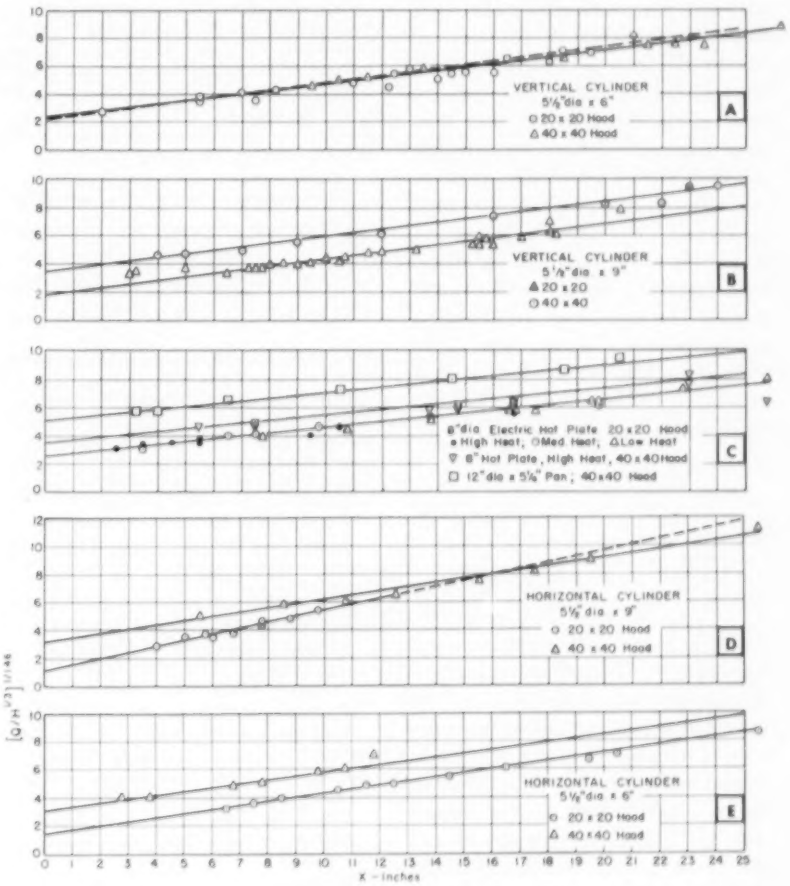


Fig. 3—Plots, from the experimental data, of $[(Q/H^{1/2})^{2/3.66}]$ vs. X. A, B, and C cover four symmetrical bodies, while D and E cover two assymetrical bodies represented by horizontal cylinders

Effect of asymmetrical shape of hot body: Sutton's equation for free convection air flow, presented at the outset, is for a hypothetical point source of heat. The pattern of flow above such a point source would be symmetrical about the vertical axis and the rising stream would be circular in shape.

For a *line source* of heat of limited length, it is obvious that the Q *vs.* Z relationship will change as Z increases. At short distances relative to the length of the line, the flow tend toward that of a point source. In view of these comments, there is little justification for presenting the experimental data in accordance with Equation 6, as has been done at D and E in Fig. 3. The limited findings are shown only to call attention to the fact that with asymmetrical heat sources, the analysis, based upon an assumed point source, can only be applied with caution. More experimental work is needed on convection flow over line sources to provide appropriate equations.

Application to Practical Design Problem

Within the limits of this study, the experimental findings confirm the equation developed by Sutton, which relates the rate of air flow established over a heated body by free convection to the rate of convective heat output from the body and the distance above the body. It thus provides a theoretical basis for calculating the exhaust ventilation requirements for canopy hoods mounted axially within relatively short distances above heated process equipment having square and round shapes. The significant relationships are as follows (velocity, fpm; Q in cfm; H in Btu/hr; Z, X, A and B in ft):

Axial velocity $= V = 9.6\,H^{1/3}(X + A)^{-0.29}$

Radius of rising stream $= r = 0.25(X + A)^{0.88}$

Distance, *point source* to top of hot body $= A = 2.15\,B^{1.16}$

Rate of air flow $= Q = 1.95\,H^{1/3}(X + A)^{1.65}$

There is an important practical limitation in the application of these relationships which can be of serious consequence. The equations are valid only in the absence of disturbing horizontal drafts which tend to break up the vertical mixing of the heated with the surrounding cooler air and also tend to tip the rising stream away from the vertical axis. It was necessary, in this study, to construct a tight, insulated cubicle with heat-reflecting inner walls, to eliminate such disturbances. Under practical industrial conditions, cross-drafts will always exist. Horizontal currents will vary in an unpredictable way and there appears to be no basis for introducing appropriate allowances for their effects in the equation. The problem, at the present time, has to be dealt with in an empirical fashion. The following steps for dealing with an actual installation are recommended by Hemeon[3]:

1. By observation, note the degree of tipping experienced by the rising stream caused by the cross-draft.

2. Make the canopy hood sufficiently large in its horizontal face dimension that it encompasses the rising stream when tipped to its maximum degree in any direction.

3. Calculate the theoretical quantity, Q, for the given distance, X (assuming $A = 2.15\,B^{1.16}$), and the area of the rising stream.

4. Calculate the design rate of exhaust ventilation through the hood as: $Q_d = Q + V_d\,(A_h - A_s)$, where Q_d is the design rate of ventilation; Q, the calculated rate of air flow established by free convection; A_h, face area of hood, great enough to encompass rising stream when tipped to maximum degree; A_s, area of rising stream; V_d, arbitrary air velocity through the extra face area of the hood not occupied by the rising stream.

The design velocity, V_d, must be in excess of the velocity of cross-drafts to prevent the escape of contaminated air. Hemeon suggests that this may be as high as 150 fpm.

Example: Assume a round furnace, 4 ft in diameter and 4 ft high, with an average surface temperature of 800 F, ambient temperature 70 F. Assume for vertical surfaces, $h_c = 0.35\,(\Delta t/L)^{0.25}$ and for the top horizontal surface, $h_c = 0.48\,(\Delta t/L)^{0.25}$, then convective heat output will be:

1. Walls: $4 \times 4\,\pi \times 0.35\,(730/4)^{0.25}(730) = 47{,}000$ Btu/hr.

2. Top: $4\,\pi \times 0.48\,(730/4)^{0.25}(730) = 16{,}000$ Btu/hr.

3. Total convective heat output = 63,000 Btu/hr.

Canopy hood is to be located 8 ft above top of furnace. Observation reveals that, owing to cross-drafts, rising stream of air may be tipped from vertical as much as 10 deg.

Determine diameter of hood face and minimum rate of exhaust ventilation.

Solution:

1. $A = 2.15 \times 4^{1.16} = 10.4$ ft.

2. $r = 0.25\,(18.4)^{0.88} = 3.3$ ft; $A_s = 34$ sq ft.

3. $V = 9.6\,(63{,}000)^{1/3}\,(18.4)^{-0.29} = 165$ fpm.

4. $Q = 1.95\,(63{,}000)^{1/3}\,(18.4)^{1.65} = 5500$ cfm.

5. To encompass the stream tipped 10 deg from vertical will require a hood with radius at the face of 6.5 ft; $A_h = 133$ sq ft; taking $V_d = 150$ fpm.

6. $Q_d = 5500 + 150(133\text{-}34) = 5500 + 15{,}000 = 20{,}000$ cfm.

In this example, the effect of cross-drafts is seen to increase the total rate of exhaust ventilation 3.5 times over the basic rate of flow in the rising stream of heated air. Thus, the disturbing air movement in the surrounding space is the overwhelming factor which determines the rate of exhaust ventilation. Failure to recognize this has been the cause of poor performance observed in many industrial installations of canopy hoods over hot-process equipment.

Practical Measures to Aid Hood Performance

Measures to improve the performance of canopy hoods over the hot process equipment, to avoid the disturbing effects of cross-drafts, should be in the direction of eliminating the basic cause of difficulty. Increasing the size of the hood and the rate of air flow through it are second steps in the solution of the problem. Obviously, the first objective should be to locate the hood as close as possible to the process equipment. One might hang flexible curtains from a fixed hood to permit entrance of other equipment to the space between the process and fixed hood or support the hood itself with a counter-balanced device and flexible pipe connection to the exhaust main so that it can be positioned close to the equipment during most of the operating cycle and easily raised when operations require more space above the equipment. Partial enclosures around the equipment may be employed in some cases to shield the operation from cross-drafts. Sources of disturbing drafts should be identified and eliminated so far as possible. The use of a man-cooling fan to offset radiant heat exposure around hot equipment is one source of disturbing cross-drafts which upset exhaust hood performance. Radiation shielding is a more basic method for control of such heat exposures and should be employed to the fullest degree. Supply air for local control ventilation and cooling should be introduced in a manner to avoid disturbing the exhaust hood performance. The air blast from a local heating unit is another potential source of disturbance which can be avoided by careful planning. Nearby equipment with moving parts may create air motion which upsets hood performance. Suitably placed baffles

will often correct such situations. Location of the exhaust ventilated equipment near windows, doors or other air intake openings is a common source of trouble which should be avoided.

Summary

1. On a laboratory scale, Sutton's equations for predicting the radius, velocity and total rate of flow in the stream of rising air over hot bodies, at various distances above the body, have been confirmed. The rate of flow is proportional to the one-third power of the convective heat output from the heated body and increases with the 1.46 power of the distance above the theoretical *point source* of heat. The *point source* is located at a distance below the top surface of the body which is proportional to the 1.14 power of the diameter of the hot body.

2. Effect of cross-drafts in the surrounding space is to tip the rising stream from the vertical. The exhaust hood must be large enough to encompass the rising stream when tipped maximally in any direction and an extra quantity of air must be drawn through the remaining area, not supplied by the rising stream, to ensure complete control. In a practical situation, this added requirement may increase the overall ventilation rate several times over the basic rate of flow in the rising stream.

3. There are at present no recorded experiences in support of or contradictory to the suggested design procedure. Some actual field studies in a variety of industrial situations are needed to confirm the practical usefulness of Sutton's equation and Hemeon's empirical corrections for the effects of cross-drafts.

Journal Section

References

1. Turbulente Ausbreitung eines Stromes Erjützter Luft, by W. Schmidt (*Zeit. Angew. fur Math. und Mech.*, Vol. 21, 1941, p. 265).

2. The Dispersion of Hot Gases in the Atmosphere, by O. G. Sutton (*Journal Meteorology*, Vol. 7, 1950, pp. 307-312).

3. *Plant and Process Ventilation*, by W. C. L. Hemeon (Industrial Press, New York).

CENSUS FIGURES

A preliminary trade report resulting from the 1954 Census of Business and covering equipment distributors who handle air conditioning and commercial refrigeration has been released. According to this report, sales of this equipment by distributors totaled nearly a half-billion dollars during 1954, an increase of 62½ percent over figures shown in the 1948 census. Also the report indicates that there were 1860 business establishments in the United States primarily engaged in buying and selling air conditioning and commercial refrigeration equipment. The six states of Texas, New York, California, Pennsylvania, Ohio and Illinois accounted for nearly half of the dollar volume of sales. Unincorporated firms without paid employees, distributors selling air conditioning and commercial refrigeration equipment as a secondary line, and sales branches and sales offices of manufacturers are not included in the sales figures given in the report.

A similar report has been released by the 1954 Census of Manufactures covering the manufacture of heating and cooking equipment and of domestic and industrial oil-burners. This report includes figures on warm air furnaces, cast iron boilers and radiators, convectors, steel heating boilers, water heaters, oil burners, and various accessories and parts used in heating. All are listed by industry classification and include both 1954 and 1947 figures for comparison.

BRITISH GUIDE

Since 1940 *The Institution of Heating and Ventilating Engineers* of Great Britain has had available its *Guide to Current Practice*. A revised edition appeared in 1950 and both these earlier editions were available in loose leaf form specially made to institution members, and sections were published in booklet form for purchase by non-members. During 1955 a new edition appeared, revised and published as a bound volume and made generally available. The new book in 6 x 9½-in. page size, contains 424 pages of technical information, an index to the Journal and Proceedings of the Institution, as well as a section of some 120 pages devoted to manufacturers' products in the form of catalogue data. The *Guide to Current Practice* is prepared under the direction of a committee and is intended to be used for reference purposes rather than as a text book. The technical section is divided into 15 sections for systematic grouping of the material. While the ground covered is essentially the same as that covered in THE GUIDE of ASHAE, there are notable differences in manner of presentation, in the general approach to subjects, and in detailed data presented. These differences no doubt largely reflect the differences in current practices in the United States and in Great Britain. Similarly, considerable parts of the information are presented in much the same fashion in both books and reflect similarity in practices.

This latest edition of the *Guide to Current Practice* appears to have been prepared with great care. Many American engineers will find it of value for reference purposes. Copies may be obtained from *The Institution of Heating and Ventilating Engineers*, 49 Cadogan Sq., London, S.W. 1, England.

John R. Allen Memorial Library

The ASHAE Committee on Research gratefully acknowledges the following gifts to the John R. Allen Memorial Library, which is maintained at the Society's Research Laboratory, 7218 Euclid Ave., Cleveland 3, Ohio.

Air Conditioning and Engineering (2nd Edition). Edited by the Engineering Staff of American Blower Corp. and Canadian Sirocco Co., Ltd. Gift of same.

Sun Angle Calculator (2). An instrument for directly reading the projections of the sun's rays with reference to buildings. Developed by and gift of Libbey-Owens-Ford Glass Co., Toledo, Ohio.

The presentation of textbooks and pamphlets in the field of heating, ventilating and air conditioning and allied fields, by authors and others, will be welcomed by this library. Suitable book plates carry the name of the donor and date of the gift.

The President's Page

The Engineer's Professional Standing

EDUCATIONAL requirements for the respective careers of medicine, law, science and engineering have much in common. It appears, however, that in the practice of these professions the engineer commands less prestige than the doctor, lawyer or scientist.

It is recognized that, apart from the small percentage engaged in consulting practice, the majority of heating, ventilating and air-conditioning engineers are associated with private industry in such capacities as design, production or sales application under the leadership of a business executive. This leaves only limited opportunity for the engineer to approach his work in a truly professional manner.

Should the Society be concerned about improving this situation? If so, what steps might be taken and to what extent?

The Society Charter and By-Laws provide that no member or Chapter may act for the Society, but it is conceivable that the Society may explore this problem inasmuch as it is something concerned with the advancement of the profession and not any one individual member or Chapter.

Like many others, your President has endeavored for a long time to determine some reason why this unbalanced recognition exists among the professions. Perhaps the expression of these thoughts will encourage you to offer comments indicating your opinion regarding this problem.

Could it be that there is something lacking in the background or educational training of the engineer which limits or restricts him from attaining professional standing in the world of business? Although occasionally an engineer with special talents is selected to handle the chief executive functions of a business, more often the man selected was trained in the legal, financial or sales aspects of the business.

Perhaps the educational process of the engineer should be examined to determine if something is lacking which prevents the achievement of deserved recognition. Personally, it is believed that a look at the medical profession and its educational approach may provide a partial answer.

At the present time many medical schools have outstanding part-time staff professors engaged in teaching, seminar lectures, and directing research teams. Because these doctors are primarily engaged in private practice the young medical student has an opportunity for intimate contact with the leaders of the profession as well as with the professors dedicated to teaching.

A similar arrangement for our profession could help the engineering student and, as a result, might attract more of them to careers in heating, ventilating and air conditioning. If strategically located companies in private industry or consulting firms would arrange for outstanding professional engineers to become associated with engineering schools on a part-time basis their knowledge of engineering practices could be transmitted to the student at an early stage in the educational process. This plan might be acceptable to school administrators, considering the present scarcity of teaching personnel.

Such an arrangement may provide the student engineer with a better understanding of how leaders in the profession approach abstract as well as practical engineering problems. Even more important these part-time professors could impart knowledge of the ethical standards necessary if the student, after graduation, wishes to gain professional recognition and community prestige.

Another subject pertinent to the professional standing of the engineer is his economic position in the community. Is he being properly remunerated based on his educational and professional background?

It is known that this has been the subject of various general surveys, but there could be value in making a special survey of our branch of engineering. This survey could reflect salary levels in various geographical areas, income based on years since graduation and the relation of income to background and experience.

By focusing the attention of the industry's leaders on the results of such a survey, reflecting income levels from comparable fields and for different responsibilities, it is entirely possible this can be extremely helpful in improving the engineer's professional and community standing.

These are some of the thoughts your President associates with this problem of a better professional standing and recognition for the engineer. What do you think would improve the situation? As an engineer and as a member of the Society your opinion will be welcomed.

John W. James

President
AMERICAN SOCIETY OF HEATING AND AIR-CONDITIONING ENGINEERS

Thermal Design of Warm Water Concrete Floor Panels

Prepared by

A Subcommittee* of TAC on Panel Heating & Cooling

and

Members of the staff‡ of The ASHAE Research Laboratory

THIS PAPER presents a simplified procedure for the thermal design of water heated floor panels for use in residences and commercial buildings. It complements the previously published paper[1].

The procedures in both papers are based primarily on the experimental data obtained at the ASHAE Research Laboratory under the guidance of the ASHAE Technical Advisory Committee on Panel Heating and Cooling.† This work has been reported in a series of research papers which are listed in the references, together with other papers which contain supplementary data.

A panel designed by this procedure will maintain the desired room air temperature for the selected outdoor conditions. Room air temperature is the selected criterion of comfort, and the design procedure is restricted to situations in which the area-weighted average temperature of the walls, the ceiling, and glass does not differ greatly from room air temperature. The room-scale tests, which simulated various conditions of construction and outdoor temperature, showed that this near-equality of the 2 temperatures normally prevails.

Design Steps

Panel design requires specification of the following: panel area, size, spacing and depth of bury of pipe or tube, insulation on the underside of the panel, and the temperature drop and the mean temperature of the water. The procedure, summarized, is as follows:

1. Calculate the hourly rate of heat loss for each room.
2. Determine the available area for the panel in each room.
3. Calculate the required unit panel output.
4. Determine the required panel surface temperature.
5. Select type, size and spacing of pipe or tube and the insulation for the underside of the panel.
6. Determine the required mean water temperature.
7. Design the fluid circuit (panel piping and mains) and determine the size of the heating equipment, following conventional practice.

Range of Application

Outside design conditions: Temperatures as low as −30 F.

Room air temperature: 70 to 76 F.

Air changes: not more than 2 air changes per hour.

Room dimensions: Rooms having normal proportions; ceiling height between 7 and 12 ft.

Room construction: Any type of wall construction and any amount of glass area. (Both, however, have an effect upon comfort.) Conventional interior finishes and furnishings.

Procedure For Hot-Water Concrete Floor Panels (Slab-on-Grade)

Step 1 — Heat Loss: Calculate the heat loss of each room, following the recommendations contained in THE ASHAE GUIDE, but do not include any heat loss through the area covered by the panel.

Example: Three Rooms, A, B, and C, are to have a common water supply temperature; that is, they represent a single zone. They are to be maintained at 72 F air temperature when the outdoor air temperature is zero F. The floors in the 3 rooms are covered with heavy wall-to-wall carpeting, without a pad. Insulation which has a conductance of 0.4 Btu/(hr)(sq ft)(F) is placed along the edge of the slab and extends downward 2 ft below it. Room dimensions, exposure, and calculated heat losses are as follows:

Room	Dimensions Ft	Exposed Wall Ft	Heat Loss Btu/hr
A	11 × 12 × 8	23	3300
B	11 × 12 × 8	12	2500
C	15 × 21 × 8	21	8000

Step 2 — Required Panel Output: Divide the heat loss of each room by the maximum floor area in the room which can be used as a heating panel. The result is the minimum heat output per square foot of panel which will satisfy the requirements of the room. (The panel which requires the highest output per square foot will generally control the design, because the temperature of the water in the system must be high enough to produce the required output from that panel.)

Room	Available Panel Area Sq Ft	Required Panel Output (qa) Btu/(Hr) (Sq Ft)
A	152	25.
B	127	19.7
C	306	26.1

Step 3 — Panel Surface Temperature: From Fig. 1, find the panel surface temperature needed to yield the required heat output to each room, using the output determined in Step 2 and the design room air temperature. This use of Fig. 1 is illustrated in Fig. 1A.

Floor panel surface temperatures in excess of about 85 F are not recommended because of the probability of discomfort to the feet. If the required heat output cannot be obtained from an 85 F floor panel, heat losses should be reduced or supplementary heating should be provided.

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*Personnel: R. L. Maher, chairman; W. P. Chapman, H. T. Gilkey, P. B. Gordon, E. F. Snyder, Jr., and J. M. van Nieukerken.

[1]Exponent numerals refer to References.

†Personnel: P. B. Gordon, chairman; W. S. Hartis, vice chairman; A. B. Algren, W. P. Chapman, John Everetts, Jr., H. T. Gilkey, E. S. Howarth, L. N. Hunter, A. T. Jorn, W. C. Kadow, G. D. Lain, H. A. Lockhart, C. O. Mackey, R. L. Maher, S. K. Smith, E. F. Snyder, Jr., W. F. Spiegel, J. M. van Nieukerken, G. L. Wiggs.

For presentation at the 63rd Annual Meeting of the AMERICAN SOCIETY OF HEATING AND AIR-CONDITIONING ENGINEERS, Chicago, February 1957.

Room	Panel Surface Temperature (t_p)
A	85. F
B	82.5 F
C	85.3 F

Step 4 — Downward and Edgewise Heat Flow: 1. Determine the temperature of the surface of the concrete slab (t_s) by adding to the panel surface temperature, the temperature difference caused by the thermal resistance of the floor covering, if any:

$$t_s = t_p + (q_u \times r_{uc})$$

The value of (r_{uc}) for various floor coverings is given in Table 1.

Room	t_p	q_u	r_{uc}	t_s
A	85. F	25.	0.8	105 F
B	82.5 F	19.7	0.8	98.5 F
C	85.3 F	26.1	0.8	106.2 F

2. Determine the downward and edgewise heat loss coefficient (h) from Fig. 2 for the insulation to be used.

Insulation with a conductance of 0.4 Btu/(hr)(sq ft)(F) extended 2 ft below the slab results in a slab downward and edgewise heat loss coefficient of 0.97 Btu/(hr)(ft)(F).

3. Apportion the downward and edgewise heat loss uniformly across the panel as follows:

$$q_{de} = P \times h \times (t_s - t_{oa})/A_p$$

Room	P	$(t_s - t_{oa})$	A_p	q_{de}
A	23	105 F	132	17.7
B	12	98.5 F	127	9.0
C	21	106.2 F	306	7.1

Step 5 — Upward Panel Resistance: Assume a tentative pipe or tube size and a spacing for each panel, choosing closer spacings and larger pipe or tube when higher heat outputs are required. From Table 2, find the thermal resistance (r_{us}) of the slab of each panel, using heat flow ratios (q_u/q_{de}) calculated from the flow rates determined in Steps 2 and 4, interpolating as required. To the slab resistance (r_{us}), add the resistance of the floor covering (r_{uc}, Step 4) to obtain the panel resistance to upward heat flow (r_u).

Room*	Pipe or Tube Spacing	q_u/q_{de}	r_{us}	r_{uc}	r_u
A	9	25/17.7 = 1.41	0.47	0.8	1.27
B	12	19.7/ 9.0 = 2.19	0.55	0.8	1.35
C	9	26.1/ 7.1 = 3.68	0.40	0.8	1.20

*All rooms: ½ in. pipe or ¾ in. tube; 4 in. concrete slab.

Step 6 — Mean Water Temperature: For the required panel output (q_u) found in Step 2, the panel resistance (r_u) found in Step 5, and the room air temperature (t_a), find the mean water temperature (t_{mw}) from Fig. 1. This use of Fig. 1 is illustrated in Fig. 1B.

Room	t_{mw}
A	116.5
B	109.0
C	116.5

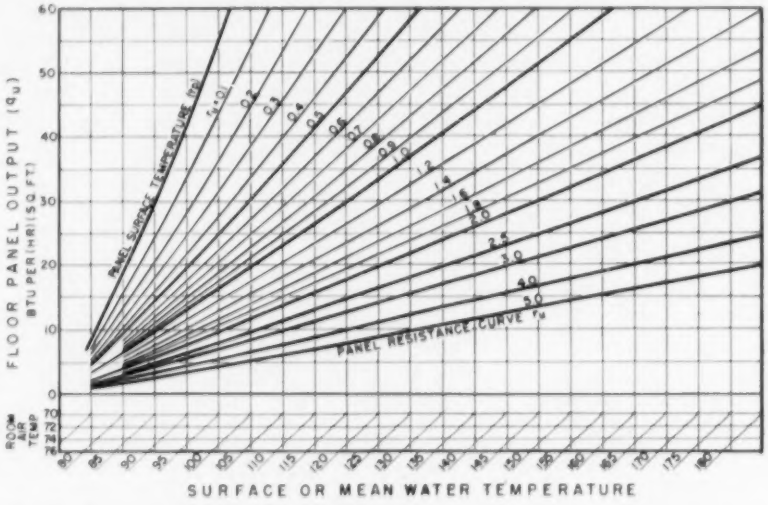
FLOOR PANEL OUTPUT (q_u) BTU PER (HR)(SQ FT)
PANEL SURFACE TEMPERATURE t_p
PANEL RESISTANCE CURVE r_u
ROOM AIR TEMP t_a
SURFACE OR MEAN WATER TEMPERATURE

Fig. 1—Floor panel design graph—panel surface temperature and mean water temperature vs. output upward

Step 7 — Design Mean Water Temperature: Select a single design mean water temperature (t_{dmw}) for each group of rooms which is to comprise a zone, choosing the highest mean water temperature (t_{mw}) of the group.

Table 1—Thermal Resistance of Floor Coverings

Description	Resistance, r_{uc} (F)(hr)(sq ft)/Btu
Bare concrete, no covering	0.00
Asphalt tile	0.05
Rubber tile	0.05
Light carpet	0.6
Light carpet with rubber pad	1.0
Light carpet with light pad	1.4
Light carpet with heavy pad	1.7
Heavy carpet	0.8
Heavy carpet with rubber pad	1.2
Heavy carpet with light pad	1.6
Heavy carpet with heavy pad	1.9

In the *example*, 116.5 F is chosen.

Step 8 — Design Panel Output: From Fig. 1, find the panel output (q_u) for design mean water temperature (t_{dmw}), room air temperature (t_a), and panel resistance (r_u). Fig. 1C shows how Fig. 1 is used in this step.

Also from Fig. 1, find the design panel surface temperature. If it exceeds 85 F (see Step 3) in a room,

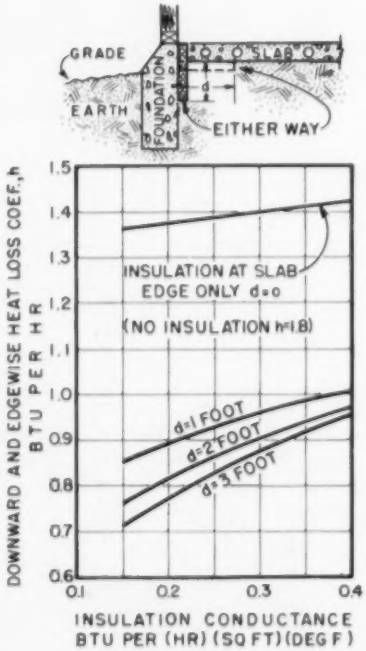

Fig. 2—Downward and edgewise heat loss coefficient for concrete floor slabs on ground

go back to Step 5 and choose a wider spacing or smaller pipe or tube for that room.

Room	(q_u)	t_p
A	25.	85. (unchanged)
B	24.0	84.5
C	26.1	85.3 (unchanged)

Step 9 — *Design Panel Area*: Divide the room heat loss found in Step 1 by the design panel output found in Step 8.

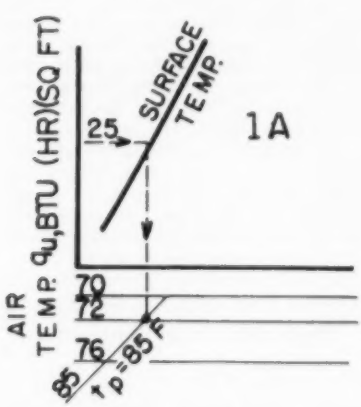

Fig. 1A—Showing use of Fig. 1 to determine panel surface temperature (Step 3)

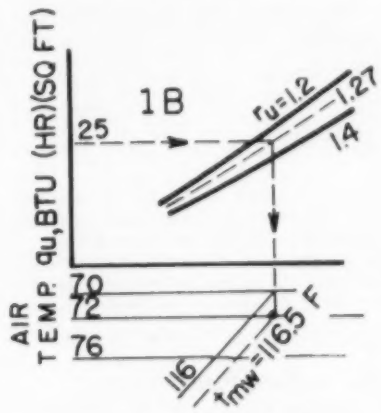

Fig. 1B—Use of Fig. 1 to determine mean water temperature (Step 6)

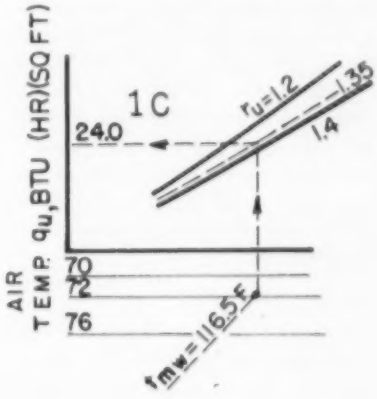

Fig. 1C—Use of Fig. 1 to find design panel output (Step 8)

Nomenclature

A_p = panel area, square feet.
C = coefficient of heat transfer, Btu per (hour) (square foot) (Fahrenheit degree) taken from lower surface of concrete slab to air below the panel (temperature, t_b).
b = downward and edgewise heat loss coefficient, Btu per (hour) (linear foot of exposed slab perimeter) (Fahrenheit degree) from concrete surface to outdoor air.
P = length of exposed edge of slab, feet.
q_d = downward heat flow from panel, Btu per (hour) (square foot).
q_{de} = apportioned downward and edgewise heat flow from panel, Btu per (hour) (square foot).
q_u = panel output (upward heat flow), Btu per (hour) (square foot).
r_t = total thermal resistance of panel to downward heat flow (Fahrenheit degrees) (hour) (square foot) per Btu.
r_{de} = thermal resistance of material between the underside of the concrete slab and the ceiling surface below (Fahrenheit degrees) (hour) (square foot) per Btu.
r_{ds} = thermal resistance of bare concrete slab to downward heat flow, (Fahrenheit degrees) (hour) (square foot) per Btu.
r_u = total thermal resistance of panel to upward heat flow (Fahrenheit degrees) (hour) (square foot) per Btu.
r_{uc} = thermal resistance of floor covering (Fahrenheit degrees) (hour) (square foot) per Btu.
r_{us} = thermal resistance of bare concrete slab to upward heat flow (Fahrenheit degrees) (hour) (square foot) per Btu.
t_a = design room air temperature, Fahrenheit.
t_{ao} = outside design air temperature, Fahrenheit.
t_b = air temperature below panel at point to which C is taken, Fahrenheit.
t_{mw} = mean water temperature, Fahrenheit.
t_{dmw} = design mean water temperature (selected for each zone) Fahrenheit.
t_p = panel surface temperature (exposed surface) Fahrenheit.
t_s = surface temperature of top of concrete slab, Fahrenheit.

Room	A_p
A	132 (unchanged)
B	104
C	306 (unchanged)

Step 10 — *Total Panel Output*: Add the apportioned downward and edgewise heat flow (q_{de}) to the design panel output (q_u) and multiply by the design panel area to obtain the total panel output. If the design panel output is appreciably different from the panel output (q_u) used in Steps 3 and 4, the apportioned downward and edgewise heat flow (q_{de}) should be redetermined.

Room	q_u	q_{de}	$q_u + q_{de}$	A_p	$A_p(q_u + q_{de})$
A	25.0[a]	17.7[a]	42.7	132	5636
B	24.0	11.6[b]	35.6	104	3702
C	26.1[a]	7.1[a]	33.2	306	10,159

[a]Unchanged. [b]Redetermined.

Step 11 — *Fluid Circuit*: Design the fluid circuit (panel piping and mains) for a temperature drop of 10 F to 20 F between the water inlet (t_i) and outlet (t_o) of the panel (see THE ASHAE GUIDE, Chapter on Hot Water Heating Systems).

Step 12 — *Boiler Size*: Size the boiler according to method contained in THE GUIDE, Chapter on Heating Boilers, Furnaces, and Space Heaters. The net Btu rating of the boiler should equal or exceed the total output of all panels plus any other loads on the boiler.

Procedure for Hot Water Concrete Floor Panels (Intermediate Slab)

Step 1 — *Heat Loss*: Follow the procedure for slab-on-grade construction, Step 1.

Table 2—Thermal Resistance of Bare Concrete Floor Panels

Panel Construction	Spacing, in.	Thermal Resistance Heat Flow Ratio q_u/q_d or q_u/q_{de} 1 up r_{us}	1 down r_{ds}	3 up r_{us}	3 down r_{ds}	5 up r_{us}	5 down r_{ds}	10 up r_{us}	10 down r_{ds}
4 IN. CONCRETE SLAB — 2 IN. COVER									
½ in. (nom.) non-ferrous tube	9	0.57	0.52	0.46	0.84	0.43	1.17	0.42	1.97
	12	0.73	0.68	0.58	1.16	0.54	1.65	0.51	2.86
½ in. (nom.) ferrous pipe or ¾ in. (nom.) non-ferrous tube	9	0.49	0.42	0.41	0.66	0.39	0.90	0.38	1.80
	12	0.63	0.55	0.50	0.93	0.48	1.30	0.46	2.55
6 IN. CONCRETE SLAB — 2 IN. COVER									
½ in. (nom.) non-ferrous tube	9	0.59	0.70	0.47	1.05	0.45	1.39	0.43	2.25
	12	0.78	0.90	0.60	1.40	0.56	1.97	0.54	3.21
¾ in. (nom.) non-ferrous tube	9	0.51	0.61	0.43	0.87	0.41	1.15	0.40	1.78
	12	0.68	0.78	0.54	1.25	0.51	1.65	0.49	2.61
¾ in. (nom.) ferrous pipe	9	0.47	0.55	0.40	0.77	0.39	0.98	0.38	1.50
	12	0.65	0.71	0.50	1.07	0.48	1.44	0.46	2.36
1 in. (nom.) non-ferrous tube or 1 in. (nom.) ferrous pipe	12	0.59	0.66	0.48	0.98	0.46	1.30	0.45	2.11
	15	0.75	0.85	0.57	1.21	0.54	1.75	0.51	2.74

Step 2 — *Required Panel Output*: Follow the procedure for slab-on-grade construction, Step 2.

Step 3 — Panel Surface Temperature: Follow the procedure for slab-on-grade construction, Step 3.

Step 4 — Downward Heat Flow Estimate: (1) Follow the procedure for slab-on-grade construction, Step 4, part 1. (2) Estimate the heat flow downward as follows: (*a*) If the underside of the concrete slab is exposed to form a ceiling, find the heat output downward (q_d) from Fig. 1 of Reference 1, using the slab surface temperature (t_s) found in Step 3 as the panel surface temperature (t_p), and the air temperature of the space below. (*b*) If the underside of the concrete slab is not exposed, use the equation:

$$q_d = C\,(t_s - t_b)$$

Step 5 — Upward and Downward Panel Resistance: Follow the procedure for slab-on-grade construction, Step 5, using Table 2 to find both resistances (r_{us} and r_{ds}).

Step 6 — Mean Water Temperature and Downward Heat Flow: (1) To determine the mean water temperature, follow the procedure for slab-on-grade construction, Step 6. (2) Use Fig. 1 of Reference 1 to find the downward heat flow (q_d). Add to the slab resistance to downward heat flow, (r_{ds}), the resistance to heat flow, (r_{dc}), of any material between the underside of the slab and the ceiling surface, to find the total resistance to downward heat flow (r_d) to be used in Fig. 1 of Reference 1. The water temperature (t_{mw}) found above and the air temperature (t_b) of the space below the ceiling are the other two factors to be used. If the heat flow downward (q_d) differs appreciably from the estimate made in Step 4, repeat Steps 5 and 6 using the calculated value.

Step 7 — Design Mean Water Temperature: Follow the procedure for slab-on-grade construction, Step 7.

Step 8 — Design Panel Output: Follow the procedure for slab-on-grade construction, Step 8.

Step 9 — Design Panel Area: Follow the procedure for slab-on-grade construction, Step 9.

Step 10 — Total Panel Output: Follow the procedure for slab-on-grade construction, Step 10, substituting heat flow downward (q_d) for the apportioned downward and edgewise heat flow, (q_{de}).

Step 11 — Fluid Circuit: Follow the procedure for slab-on-grade construction, Step 11.

Step 12 — Boiler Size: Follow the procedure for slab-on-grade construction, Step 12.

APPENDIX

All the figures and tables included in the design procedure are based on data developed at the ASHAE Research Laboratory, unless otherwise noted. The methods by which the figures and tables were derived are identified in this Appendix.

Fig. 1. Floor Panel Design Graph

Fig. 1 and Fig. 1 of Reference 1 are similar in form and use. Both were plotted from points calculated as outlined in the Appendix to Reference 1. The equations used in the calculations for Fig. 1 were:

$$t_p = [(t_s + \Delta t) - AUST]/0.32 + AUST \quad \text{.....(A-1)}$$

(Reference 2, Fig. 7 and 10)

$$q_{ru} = 1.52 \times 10^{-8}\,[(t_p + 460)^4 - (AUST + 460)^4] \quad \text{....(A-2)}$$

(Reference 3)

$$q_{cu} = 0.31\,[t_p - (t_s + \Delta t)]^{1.31} + \Delta q_{cu} \quad \text{.....(A-3)}$$

(Reference 3 and Reference 2, Fig. 4.)

Some panel performance data calculated by means of Equations A-1, A-2, and A-3 are given in Table A-1.

Table A-1—Some Results of Panel Performance Calculations

t_s	72	72	72	72
$AUST$	71	72	73	74
Δt	5.6	5.6	5.7	5.7
t_p	85.4	85.3	81.5	79.3
q_{ru}	15.7	10.6	8.0	4.9
q'_{cu}	6.2	4.5	3.2	1.7
Δq_{cu}	6.9	6.9	6.8	6.7
q_u	26.8	22.0	18.0	13.3

The family of curves relating floor panel output (q_u) to mean water temperature (t_{mw}) were plotted from the equation:

$$t_{mw} = t_p + r_u q_u \quad \text{.....(A-4)}$$

The correcting section of the abscissa was constructed as described in the Appendix to Reference 1.

Test conditions were as given in the Appendix to Reference 1 and the comments contained therein also apply to Fig. 1 of this paper. Additional References are 4, 5, 6 and 7.

Fig. 2. Downward and Edgewise Heat Loss Coefficient for Floor Slabs on Grade

The heat loss coefficient given by Fig. 2 was calculated to combine into a single coefficient the downward heat loss and the edgewise heat loss of a floor slab on grade. The coefficient is based on the exposed perimeter of the slab and the difference in temperature between the slab and the outside air.

The downward heat loss from the panel shown in Fig. 2 was approximated by calculating the heat flow from the slab shown in Fig. A-1, modifying the results to allow for the difference in arrangement between the slabs in the 2 figures. The procedure used was as follows:

The slab shown in Fig. A-1 is infinitely long and is on ground which is of infinite width. The heat flow through the ground from the slab per degree temperature difference between the 2 isothermal surfaces, is:

Nomenclature in Appendix

The following terms used in the Appendix are not defined in the paper:

- $AUST$ = area-weighted average temperature of unheated surfaces in room, Fahrenheit.
- x = dimension used in Equations A-5 and A-6, (see Fig. A-1), (feet).
- C_1 = conductance of insulating material at slab edge, Btu per (hour) (square foot) (Fahrenheit degree).
- f_o = outside film conductance, Btu per (hour) (square foot) (Fahrenheit degree).
- h_e = heat loss from edge of slab, Btu per (hour) (foot) (Fahrenheit degree).
- l = slab length, (feet).
- k_s = conductivity of soil, Btu per (hour) (square foot) (Fahrenheit degree per foot).
- k_1, k_2 = conductivity of material, Btu per (hour) (square foot) (Fahrenheit degree per inch).
- L = thickness of slab, (inches).
- q_{cu} = convection component of panel output (upward heat flow), Btu per (hour) (square foot).
- q'_{cu} = convection component of panel output (upward heat flow), no infiltration, Btu per (hour) (square foot).
- Δq_{cu} = increase in convection component of panel output (upward heat flow) caused by infiltration, Btu per (hour) (square foot).
- q_{ru} = radiation component of panel output (upward heat flow), Btu per (hour) (square foot).
- b'_s = heat loss through earth per foot of exposed edge of floor slab of infinite length (see Equation A-7), Btu per (hour) (foot) (Fahrenheit degree).
- b''_s = heat loss through earth for width x, per foot of exposed edge of floor slab of infinite length (see Fig. A-1 and Equation A-5), Btu per (hour) (foot) (Fahrenheit degree).
- $\frac{db''_s}{dx}$ = rate of heat loss through earth at distance x, per foot of exposed edge of floor slab of infinite length (see Fig A-1 and Equation A-6), Btu per (hour) (square foot) (Fahrenheit degree).
- b_s = heat loss through earth per foot of exposed floor slab edge of length l (see Equation A-7), Btu per (hour) (foot) (Fahrenheit degree).
- Δt = decrease in room air temperature caused by infiltration (see Fig. 10, Reference 2), Fahrenheit.
- w = slab width, feet.
- X_1, X_2 = thickness of materials, inches.

$$h''_s = \frac{k_s}{\pi} \ln \sqrt{\frac{\left(x - \frac{w}{2}\right)^2}{\left(x + \frac{w}{2}\right)^2}} \quad \text{.....(A-5)}$$

This equation was derived in the ASHAE Laboratory, using the Schwarz-Christoffel transformation to change a simple straight line heat flow pattern to that illustrated in Fig. A-1. It shows that the

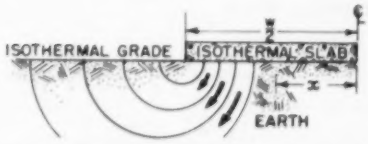

Fig. A-1—Heat floor pattern between floor slab and grade

heat flow is infinite at the exposed edge ($x = w/2$). In practice the heat flow is not infinite because there is usually at least 8 in. of concrete between the edge of the slab and the exposed grade. The assumption was made that the heat flow at any point would be no greater than if 8 in. of concrete (conductivity 1.5) were the only thermal resistance. That is, the rate of heat loss.

$$\frac{dh''_s}{dx} = \frac{2k_s}{\pi} \frac{\frac{w}{2}}{\left(x - \frac{w}{2}\right)\left(x + \frac{w}{2}\right)} \leqq 1.5 \quad \text{.....(A-6)}$$

The heat flow was calculated separately for each of the first 3 ft and for the balance of the slab. The apparent heat flow resistance for each of the first 3 ft was then calculated from the heat flow. The resistance of the first foot of insulation was assumed to be in series with the calculated resistance of the first foot of slab, the second foot of insulation with the second foot of slab, the third foot of insulation with the third foot of slab. The total resistance of each foot was used to calculate the heat flow from the slab.

A factor to convert the heat flow (h'_s) from an infinitely long slab to the heat flow (h_s) from a slab of given length was developed by Macey, Reference 8. The adaptation of the factor which was used was:

$$h_s/h'_s = (0.6w + l)/(w + l) \quad \text{...(A-7)}$$

Edgewise heat loss was calculated from:

$$h_e = \frac{\frac{L}{12}}{\frac{1}{f_0} + \frac{X_1}{k_1} + \left(\frac{X_2}{k_2} \text{ or } \frac{1}{C_1}\right)} \quad \text{.....(A-8)}$$

The combined coefficient is the sum of the downward and edgewise coefficients:

$$h = h_s + h_e \quad \text{.....(A-9)}$$

Fig. 2 was plotted from points determined by calculating the losses from a 24 ft × 36 ft slab, 4 in. thick. Conductivity of concrete was assumed to be 1 Btu per (hr)(sq ft)(F per foot) and conductivity of soil 10/12 Btu per (hr)(sq ft)(F per foot). Equation A-6 was used to determine the point at which $dh''_s/dx = 1.5$. It was found to be at $x = 11.8$ ft and $dh''_s/dx = 1.5$ was used from $x = 11.8$ ft to $x = 12.0$ ft. Other values are tabulated in Table A-2.

Table A-2—Data Used in Determining Fig. 2

Loss Area	From x_1 to x_2	Heat flow (h''_s to x_1 − h''_s to x_2)		Resistance (h''_s to x_1 − h''_s to x_2)$^{-1}$
Part 1st ft	12.0-11.8	(0.2 x 1.50)	0.30	
Part 1st ft	11.8-11.0	(1.27-0.83)	0.44	
Total 1st ft	12.0-11.0		0.74	1.35
2nd ft	11.0-10.0	(0.83-0.64)	0.19	5.26
3rd ft	10.0- 9.0	(0.64-0.52)	0.12	8.33
Bal. of slab	9.0- 0.0	0.52	0.52	
Total slab	12.0- 0.0		1.57	

Corrected for 24 ft × 36 ft. slab,

$h_s = 1.57\ [(0.6 \times 24) + 36]/(24 + 36) = 1.57 \times 0.84 = 1.32$

If insulation having a conductance $C_1 = 0.4$ is used under the first 3 ft of the slab, the heat loss is reduced to

$h'_s = [1/(1.35 + 1/0.4)] + [1/(5.26 + 1/0.4)] + [1/(8.33 + 1/0.4)] + 0.52 = 1.00$

Corrected for 24 ft × 36 ft slab,

$h_s = (1.00 \times 0.84) = 0.84$

Slab edge loss for a 4 in. slab and a 6 in. thick footing without insulation is

$h_e = (4/12)/(1/6 + 6/12) = 0.50$

and with insulation, $C_1 = 0.4$

$h_e = (4/12)/(1/6 + 6/12) + (1/0.4) = 0.11$

The combined downward and edgewise heat loss coefficient is thus:

$h = 1.32 + 0.50 = 1.82$	No insulation.
$h = 1.32 + 0.11 = 1.43$	Insulated at edge only, $C_1 = 0.4$.
$h = 0.84 + 0.11 = 0.95$	Insulated at edge and for 3 ft under slab, $C_1 = 0.4$.

The heat loss coefficients given by Fig. 2 should be considered as approximations because of the simplifying assumptions made in their calculation and because of the differences in construction and thermal conductivities likely to be met in practice. In some cases, it may be advisable to use Equations A-5, A-6, A-7, and A-8 to calculate the heat loss, adjusting them to construction involved. In most cases, however, the value of the coefficient given in Fig. 2 should be sufficiently accurate for practical heating calculations involving either heated or unheated floor slabs.

Table 1. Thermal Resistance of Floor Coverings

The thermal resistances tabulated were calculated from data reported in References 6 and 9.

Journal Section

Table 2. Thermal Resistance of Bare Concrete Floor Panels

That data for this table were obtained in exactly the same way as were the data for Table 2, Reference 1. See also Reference 10.

References

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Solar Radiation Utilization

By Richard C. Jordan*, Minneapolis, Minn.

Since all of our fossil fuels including oil, coal, gas, oil shales and tar sands, hydroelectric power, energy stored in vegetation and most of our winds have originated from the sun, the sun indirectly supplies most of the earth's energy. Although our stored fossil fuels were deposited hundreds of millions of years ago, approximately 85 percent used by man to date has been consumed during the relatively short period of time since 1900.

The total annual energy consumption of the entire world at present is approximately the equivalent of 4 billion tons of bituminous coal and is about 10 times greater than the world energy consumption of 100 years ago. However, if the current world population of 2.3 billions doubles or triples, as estimated, within the next 100 years, and if it is possible to make energy available commensurate with that necessary for our increasing standards of living throughout the world, between the years of 1950 and 2050 the world energy requirements will total the equivalent of 3000 to 15,000 billion tons of coal.

If we are limited to the use of fossil fuels, however, such projected increases in energy consumption would be impossible since our total world deposits would, at this rate, last but a few years. Further, it now appears probable that by the turn of the century the majority of our natural gas and oil as well as some of our coal deposits will be needed primarily in the synthesization of petrochemical products.

Paralleling these trends United States electrical energy consumption in kilowatt hours per year per household has virtually doubled each decade since 1920. In 1955 this consumption was 2750 kwhr per year per household customer, and the projected 1965 figure is 6000.

The world must therefore look to other comparatively untapped sources of energy and power to enable civilization to reach its full potential of development and to enable the underdeveloped countries to progress from poverty and slavery to a status where the dignity of the individual is recognized. Energy consumption per unit of population is one of the best criteria of the standards of living of countries. Fortunately, two vast sources of energy remain virtually untapped, and their availability depends to a great extent upon further technological breakthroughs. The harnessing of nuclear energy such as through uranium and thorium breeder reactors and the harnessing of solar energy either for direct space heating or for conversion to electrical or mechanical energy are certain to become widely developed and used during the next 50 years. Our coal and uranium resources will probably find their greatest application through our burgeoning electrical demands.

Currently and in the foreseeable future, the percentage of all of our energy demands in this country utilized for space heating is and will be approximately 35 percent. Space heating is accomplished at very low energy levels, and the use for such purposes of fuels capable of generating high temperatures is an economic waste. Solar energy, however, is most efficiently collected at low temperature levels and for this reason is destined to find one of its initial economic uses in partially supplying the total energy demands needed for this purpose.

In 1955 recognition of the potential importance of this area of activity to our Society was formalized by the formation of the Technical Advisory Committee on Solar Energy Utilization. Because of the worldwide interest in this activity, the committee is international in scope and includes members from Malaya, Israel, Sweden and India, as well as from the United States and Canada. Two meetings of the committee have been held to date, last November, in Phoenix, Ariz., at the time of the World Symposium on Applied Solar Energy and in Washington this June at the time of the Semi-Annual Meeting of the Society. The scope of the committee has been defined as the development of basic and applied information pertinent to the use of solar energy for heating, cooling, distillation, and drying. Currently the committee is in the process of preparing an outline of the research needs which it envisions as necessary for the proper development of solar utilization within the area of its interests and it is intended that this be submitted for publication within the next few months.

*Chairman, ASHAE Research Technical Advisory Committee on Solar Energy Utilization.

Future Electronic, Solar and Nuclear Developments in All-Year Residential Air Conditioning

By W. F. Friend*, New York, N. Y.

A CHARACTERISTIC of all 3 of the specific developments named in the title is that, technologically, they still are at the early stages of research and development. They require *basic research*, which means *critical and exhaustive investigation and experimentation with the aim of discovering new facts and correctly interpreting them*. This research must further be implemented by *development*, whereby the *fruits of discovery become more available or useful, through a succession of stages each preparatory to the next*.

Moreover, in a broad way each of the subjects is related to power and energy — their production and utilization, and thus with conservation of world resources. Unless a continuing and expanding supply of energy, both thermal and electrical, can be assured through the years ahead, the material advances that have been gaining momentum through the past half-century will ultimately be checked or even reversed. We hear that residential energy consumption per customer, in the United States now averaging about 2500 kwhr annually, can be expected to reach a level between 10,000 and 20,000 within the next 2 decades. Air conditioning is one of the giant strides toward better living, and already it has accounted for a major component of the increasing load from residential users, who must be served by the electric and gas utility systems of the nation.

Growth of population and changing economic trends likewise are important factors in the expansion of electric utility systems over the country as a whole. Since the last World War they have seen their loads double about every 10 years, and recently there is talk of a doubling in as little as 8 years in some regions. This strongly supports the conclusion that energy resources must be augmented soon, by bringing solar and nuclear power to the stage of commercial feasibility, lest conventional fuels under the pressure of rising consumption become prohibitive in cost.

The necessity for extensive research, before the principles of electronic refrigeration and of solar and nuclear energy conversion can be defined and their utilization reduced to practice, should not discourage engineers belonging to this Society. They were pioneers in establishing broad research activities within their profession, and in founding and operating a research laboratory of world-wide reputation. The work conducted by the Society on the fundamentals of maintaining human comfort and health through control of the 5 basic elements that compose air conditioning, and the perfecting of equipment types that embody those principles, have been outstanding achievements extending through nearly 3 decades. Results equally successful can confidently be expected in these new domains, within a comparable period.

Electronic Cooling

By this term is meant refrigeration, or removal of heat, the temperature reduction being produced directly by the flow of an electric current — in this case the movement of electrons within a continuous circuit composed of solid materials. The use of socalled *electronic* devices and complex circuits like those employed in radio and television apparatus is not involved. The principles in general are called *thermoelectric effects*, a term denoting energy conversion as between heat and electricity.

Four effects, (Table 1) identified by the names of their respective discoverers, are present in electronic cooling.

Likewise involved is the principle of conduction, wherein heat is transported or an electric current made to flow between 2 points, by creating a difference of temperature or electric potential. The several effects are stated in the phrasing conventionally employed, in Table 2; reversibility of the action is indicated by entries in the column at the right.

Usually the Peltier effect, which can be considered the converse of the Seebeck effect utilized in the ordinary thermocouple for temperature measurement by the electrical method, is said to be the essential principle of electronic refrigeration. However, each of the other principles is also involved in such apparatus and must be taken into account in its design.

For a successful device, the selection of materials is of primary importance. Three criteria must be satisfied as listed in Table 3. Thermoelectric power (a) is defined as the rate of change of thermoelectric force (or voltage) with temperature.

Until recently, no materials were known, possessing properties that could satisfy the conflicting requirements well enough to enable building a device with acceptable performance. The materials principally used by early experimenters in electronic cooling were antimony, bismuth,

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Presented at a Symposium on Residential Air Conditioning at the Semi-Annual Meeting of the AMERICAN SOCIETY OF HEATING AND AIR-CONDITIONING ENGINEERS, Washington, D. C., June, 1956, under the title, *Future Developments—Electronic, Solar, Nuclear*; see also abstract on pages 137 to 139, JOURNAL SECTION, *Heating, Piping & Air Conditioning*, September 1956.

copper, germanium, silicon, tin and zinc. They proved unsatisfactory, since the maximum cooling ranges obtainable varied only between 9 and 16 C (15 and 30 F), and efficiencies were extremely low.

Applicable materials are now generally classified under 3 types: pure metals, alloys, semiconductors. Characteristics of these with respect to the performance criteria are as listed in Table 4, the reference letters being those previously defined. Thermoelectric powers for semiconductors may range up to hundreds of times those for metals. The conductivity ratio (thermal-to-electrical), known as the Wiedermann-Franz ratio, is approximately constant for all pure metals, with value 2.3×10^{-8} expressed in appropriate units.

Thus semiconductors offer real promise and are being closely investigated. Their unique properties arise from the type and concentration of impurities, present either naturally or by intention; also from crystal imperfection and energy relations within the material. The common semiconductors are considered to include:

Elements	Ge, Se, Si
Compounds	CdS, CuO, CuS, PbS
Intermetallic compounds	Bi_2Te_3, ZnSb, InAs

Electrical conductivity in semiconductors is attributed to the relatively small number of electrons or the presence of socalled *holes*, whereas thermal conductivity is contributed mainly by vibrations of the crystal lattice. Because substances of high atomic weight have better ratio of electron mobility to heat conductivity, than do those of smaller numbers in the periodic table, they show the best promise.

With semiconductors both thermoelectric power and electrical conductivity depend upon concentration of the current carriers they contain. These carriers comprise both an electronic component and a lattice or structure component. Thermal conductivity may be nearly independent of the carrier concentration when the major contribution to conduction of heat comes from the elastic vibrations of the lattice, as is the case with germanium, a metal that has become prominent recently through its use in transistors which are supplanting vacuum tubes for many types of electronic applications.

With electronic cooling, it is customary to use the term Coefficient of Performance (COP) for expressing efficiency. This is the ratio of heat quantity absorbed (refrigerating effect) to the power required or the *work* input, measured in the same units. An alternate expression is:

COP = heat flow rate/power input

For an ideal thermodynamic device, theoretical efficiency is proportional to the ratio of drop in temperature from source to sink, to absolute temperature of the source. Since COP by definition is the reciprocal of heat-power cycle efficiency, it may be expressed as:

$$COP = T_2/(T_1 - T_2),$$

where

T_1 = temperature of the sink.
T_2 = that of the source.

Values of COP reported to have been attained have been low — under about 0.3 for a temperature range 20 C (36 F). They decrease markedly when the range needed becomes greater.

Mathematical analysis of the principles underlying the thermoelectric effects listed in Table 2 is built upon the well-known three laws of thermodynamics which correlate heat, work and entropy changes; thermoelectric power and temperature are also involved. Such analysis leads directly to the conclusion that there is no theoretical limit on the value of COP that might ultimately be realized. Only practical limitations need be overcome. Moreover, investigations in the huge new field of transistor technology and the advances in so-called *solid state physics* will continue to provide basic knowledge applicable to electronic cooling.

A concrete achievement already attained is the prototype for a household refrigerator announced late in January 1955, the outcome of de-

Table 1—Effects Present in Electronic Cooling

Effect	Device	Cause	Result
Seebeck	Junction of dissimilar metals	Temperature difference	Electric current
Peltier	Junction of dissimilar metals	Electric current	Heat emission or absorption
Thomson	Single conductor	Temp gradient; also current	Heat emission or absorption
Joule	Electric circuit	Electric current	Heat generation and emission

Table 2—Thermoelectric Refrigeration for Air Conditioning — Basic Principles and Definitions

Effect	Action Produced	Condition Maintained	Reversibility
1—Thermoelectric	Energy interchange, or conversion between heat and electricity	Difference of temperature or of electrical potential, between two points or across a junction	See (2) to (5)
2—Seebeck (1821)	Electric current within a closed circuit composed of two dissimilar conducting metals	Junctions kept at different temperatures	Yes, then becoming (3)
3—Peltier (1834)	Heat absorption or emission produced at junction of two dissimilar conducting metals	Electric current passed through junction by application of voltage	Yes, then becoming (2)
	Direction of current flow determines whether heat is absorbed or emitted, *i.e.*, whether temperature is lowered or raised		
4—Thomson	Heat absorption or emission along a single electrical conductor having a finite temperature gradient	Electric current passed through conductor, while temperature gradient maintained	Yes
	(Flow same as noted for 3 — Peltier effect)		
5—Joule	Conversion of electrical energy into heat	Electrical current passed through conductor	No
6—Conduction	Transport of heat or flow of current between two points in any substance	Difference of temperature or electrical potential	No

velopment work begun in 1951. The demonstration model is described as having a large number of thermojunctions arranged in 2 groups, for the main cooling compartment and the freezing unit respectively, with heat removal by tap water. The statement was made by the manufacturer, that prior to commencing work 4 years earlier, the best performance known to have been achieved with the Peltier effect was a lowering of temperature by 9 C (16 F). New

Table 3—Criteria for Selection of Material

Property	Requirement
(*a*) Thermoelectric power of junction	High
(*b*) Thermal conductivity between junctions	Low
(*c*) Electrical conductivity of circuit	High

alloys more recently developed are giving temperature drops several times as great. Work in the laboratories is continuing on the refrigerator and on compact units intended for comfort air conditioning, that will require no external circulating water for heat removal.

In England encouraging results have been reported with junctions using the n-type semiconductor Bi_2Te_3 and metallic Bi which produces 26 C (47 F) maximum temperature difference with coefficient of performance believed as high as 0.25. There are hopes that the electrical-to-thermal conductivity ratio can be further improved by a factor of 4 or 5, and if this is ultimately accomplished, a temperature difference of better than 80 C (144 F) should be realized.

In the United States, thermoelectric effects are known to be under investigation at Battelle, Cornell, Franklin Institute and other laboratories, and among European countries in England, France, Germany and Sweden. The work, conducted mainly under the direction of solid state physics specialists, embraces both theoretical and experimental research to determine the materials, geometry and fabrication methods for commercial applications of Peltier junctions, and related factors in thermoelectric behavior.

When solutions to the interrelated problems are found, the principles of *electronic cooling* give promise that they can with equal success be applied to the direct conversion of heat into electric power. Moreover, they may also be found applicable to power generation with radiation from the sun and from the radioactivity that can be created by nuclear reactions.

Solar Energy

In prehistoric times, man had at his command but 2 primary sources of energy — the sun and the force of gravity. Winds and falling water were harnessed too, but both of these are merely indirect manifestations of solar energy. With the invention of methods for kindling a fire, primitive man obtained a controllable and abundant source of energy. The later discovery of the fossil fuels — coal, oil, gas — and of efficient methods to recover and utilize them, provided world energy resources that until recently have seemed practically inexhaustible. Today, the end of the reserves that may be exploited com-

Table 4—Performance Characteristics of Pure Metal and Semiconductors

	Thermoelectric Power (*a*)	Conductivity Ratio (*b*)/(*c*)
Property Requirement	High	Low
Characteristic of materials		
Pure metals	Very low	Constant
Alloys	... Wide Range ...	
Semiconductors	Quite high	Much lower than for metals

mercially is coming into sight. Nuclear fuels will certainly help posterity, if not the generation now living, but solar energy seems assured as long as life continues on this planet.

The laws that govern the quantity and angular direction of solar radiation, received at a given spot on the earth's surface, have become well known. Weather Bureau stations, observatories and solar research laboratories are supplying voluminous local data on sunshine availability and its relation to the local needs for heat. The work by R. C. Jordan and J. L. Threlkeld at University of Minnesota, presented recently in a series

of ASHAE papers, provides a sound basis for design of utilization systems and equipment. Further useful information is contained elsewhere in ASHAE literature, much of it having originally been secured from the *liability* standpoint, since for summer air conditioning, solar radiation is unwanted and forms a substantial component of the cooling load to be handled by air-conditioning systems.

The primary application for solar energy, that is likely to become useful and economic in the not distant future, is in space heating. Many ingenious arrangements of structure to derive benefit from direct sunshine were devised by the ancients. Further adaptations suited for modern living requirements and architecture are being invented and put to use today. The chief deterrents are economic, since without an effective method to accomplish thermal storage, a supplementary heating source is necessary for use through periods devoid of sunshine, and this is expensive. Seldom can solar energy be applied economically as a supplement to conventional heat sources, merely to reduce fuel bills.

The indirect method of space heating, which involves both a solar collector and a heat-transfer medium, represents the direction of main development effort today. Collector systems are of 3 basic types:

(1) Focusing reflector, essentially a movable mirror.

(2) Flat plate absorber, essentially a shallow insulated box with glass or plastic cover plates.

(3) Intermittent system, employing gases that absorb radiant energy.

In the first type (1), the mirror reflectors must have parabolic shape, either circular or cylindrical, and be moved manually or by motor drive to keep pace with *travel* of the sun. Disadvantages are high initial cost and maintenance expense, along with vulnerability to storm damage, these outweighing the benefits from higher temperature obtained. The second type (2), is based on the

greenhouse principle, using a box or frame that has at the bottom a dull black plate conductively bonded to a tube through which a heat-transfer fluid is continuously circulated, or an equivalent form of construction if air or a gas is the heat-transfer medium. Four sheets of cover glass give the best thermal performance, but

Table 5—Representative Values for Vertical South-Facing Collectors Having 2 Sheets of Glass

Weather	Time a.m.	Time p.m.	Btu per Sq Ft per Hr	Efficiency, Percent, Temperature Difference, F: 50	100	150
Clear	10	2	300	60	48	31
Few clouds	10	2	200	54	36	12
Overcast	Early a.m. to late p.m.		100	37	0	—

at present prices 2 or at most 3 are the economic maximum. The intermittent principle in (3), whereby gases change their temperature, pressure or molecular form under the effects of solar radiation, remains comparatively undeveloped.

Collector efficiency for the flat-plate type (2) depends on the specific design, materials used including thermal insulation, physical condition, orientation, weather conditions, and upon temperature difference established between the collector plate and outdoors. Some representative values for vertical south-facing collectors having 2 sheets of glass are shown in Table 5. The low efficiencies realized with high collector temperatures on cloudy days require that, for house heating, only moderate temperatures be employed.

In the southeastern region of the United States, the 1000 sq ft of ground area occupied by an average residence receives on a sunny mid-winter day about 500,000 kilo-calories of heat. This is equivalent to 600 kwhr and represents 170 Btu per sq ft averaged over the 24-hr daily cycle. If collector efficiency is 30 percent, the amount useful for heating becomes 180 kwhr, which is about equal to the daily heat requirement. However, some method for heat storage is essential in nearly all cases to maintain acceptable indoor temperature throughout the night hours and on cloudy days.

Thermal storage in many forms has been investigated for dwellings heated by solar radiation and by electricity. The systems tried include:

Massive wall and floor construction, usually of masonry.

Bins filled with rock or gravel, arranged with passageways or pipes for circulating air or water.

Tanks containing heated water or other fluid, with provision for fluid circulation by pumping or thermosyphon effect.

Chemical transition compounds employing the heat-of-fusion principle.

Performance obtained with experimental storage installations has been recorded in many tests and analyzed to determine the best combination of storage type and capacity, and especially to secure correlation with the collector, since the use of storage usually requires higher operating temperature and thus penalizes collector capacity and efficiency. The chemical methods have shown considerable long-range promise, but progress toward a reliable and economic system has been slow. The unsolved problems relate to nucleation, rate of crystallization and solution, vulnerability to corrosion, cost of construction and expense for maintenance.

Another form of thermal storage, applicable to residential heating and universally available, is use of the ground beneath or adjacent to a dwelling. Thermal properties of soils have been investigated through the past decade, to a limited extent with storage of heat gathered by solar collectors as the objective and in greater detail as the means for dissipating heat given off by buried electric cables and as a potential heat source for electric heat-pump systems. Heat extracted from the ground in the latter case is basically derived from solar radiation, either directly or in an indirect manner by transfer from the ambient air and from rainfall. Extensive bibliographies now available cover theoretical analyses of heat transfer phenomena involved, and the test results obtained from research projects and trial installations of many varieties under the range of working conditions encountered in normally occupied dwellings.

Another method of gathering solar energy is applied for house heating in connection with electric heat pumps that use outdoor air as the heat source. By placing the evaporator coil of the refrigeration (heat-pump) system in a location where it receives incident radiation directly, the heat so absorbed raises the input temperature and improves the heat-pump COP. Basic principles, test results and economic evaluations in this field have been covered in the literature, notably from the work reported by Ambrose, Jordan, Lof, Threlkeld, Voegli and others.

Use of solar radiation as an energy source for summer air conditioning is contemplated in various studies and experimental projects concerned with residential heating. The absorption cycle, adapted to operate with a modest spread between heat intake and rejection temperatures, is employed in the majority of cases.

Solar water heating for domestic uses has a long history in both tropical and temperate zones throughout the world. Design data today are well established. The difficulty of obtaining an economic balance in relation to storage capacity and to supplementary heat from fuel or electric energy during sunless periods and in cold weather, remains the chief restraint to wider adoption of this water-heating method.

Power from solar radiation, both mechanical and electrical, has been an inventor's dream and a research-and-development goal for at least a century. Many ideas have been proposed, condemned, tried, and catalogued. The socalled *solar battery* represents perhaps the greatest advance within the last decade, with the underlying research quite fully disclosed. It utilizes transistor elements to convert the radiant energy from the sun into electricity. Small size units, low efficiency of solar energy conversion, and high costs are still serious limitations, which the sponsors of the solar battery develop-

ment have freely stated will continue to require talent, money and time.

The present status of solar energy utilization was reported in great detail during November 1955, at the World Symposium on Applied Solar Energy held in Phoenix and Tucson, Ariz., under direction of the *Association for Applied Solar Energy* founded at Phoenix earlier in that year. The extensive proceedings of the Symposium, published several months ago, are commended to engineers and research workers who may become concerned with either the theoretical or practical aspects of solar-utilization technology. The same organization has published a comprehensive bibliography of the literature, extending through nearly a century.

Nuclear Energy

Among the investigations being conducted under governmental auspices and by private agencies, into the peaceful uses of atomic energy, none has yet given specific attention to residential air conditioning. The socalled McKinney Panel, which issued its report in January of 1956, had received the assignment "to appraise the present and future impact of all aspects of the development of atomic energy on our way of life, our economy, our industry and our natural resources . . . . ." The report makes mention of district heating service but stops short of residential applications. Accordingly, the newly formed Nuclear Energy Engineering Committee of the ASHAE, when considering the scope of activities it might usefully undertake, will doubtless have that subject on its agenda.

Principal directions in which future developments in the fields of atomic energy might ultimately affect residential air conditioning are:

1. As a supplementary *fuel* or heat energy source for bulk generation of electric power, thereby tending to extend the useful life of present conventional domestic fuels.

2. As assurance that electric power will continue to be available, abundantly and at low cost.

3. Under circumstances favorable to the establishment of district heating systems, as a fuel for producing steam or hot water for distribution to consumers.

In each of these cases, the utilization of nuclear fuels would be confined to relatively large installations — of capacity perhaps ranging between 100,000 and 1,000,000 lb steam per hr, and under conditions permitting operation at a high annual load factor. Smaller installations and low load factors would be penalized by excessive cost and space requirements for the bulky shielding to confine the dangerous radiations, and for other safety measures.

The socalled *nuclear fuels*, which release heat energy through fission in a controlled chain reaction, are the heavy elements uranium and thorium. Estimated world reserves of uranium reported a half-decade ago had between 20 and 25 times the total heat energy in the available fossil fuels — coal, oil, gas — recoverable commercially at cost levels not exceeding twice the current costs; thorium was considered to be more plentiful than uranium. Today, the estimated reserves of uranium have been multiplied by a factor of 2 or 3, as the result of continuing explorations with more refined prospecting techniques and devices, and more adequate knowledge of the geologic formations in which uranium can occur.

Thermonuclear fuels, which operate on the fusion principle and include certain forms of hydrogen, lithium and perhaps ultimately other light elements, have greatly augmented our potential energy reserves and initially our stockpiles of weapons. These fuels can be expected sooner or later to become usable in controlled reactions, releasing heat for thermal applications and for electric power generation, as well as for propulsion, in a manner comparable to that employed with the fission process. The outlook for utilizing the fusion process is uncertain today, owing in part to delays by governmental agencies in releasing to industry the needed basic information and the right to investigate nonmilitary applications of fusion technology.

The methods presently contemplated for utilizing nuclear fuels all involve use of some type of reactor — an apparatus in which a sufficient quantity of uranium or thorium is placed in such manner that a controlled chain reaction can occur, the released thermal energy then being transferred to associated apparatus of conventional types. Many forms of reactors are under investigation for generation of electric power and for propulsion of ships and aircraft. The same types will likewise become applicable to the production of heat for warming buildings, subject to the specific economic and practical considerations that pertain to space heating. Since comprehensive reviews of the present status and the outlook for civilian atomic power have been appearing in current publications, including notably the May 28, 1956 issue of *Electrical World* magazine, the presentation here does not undertake to go into the subject.

The possibility exists of obtaining atomic power from radioactive substances, by utilizing the properties of semiconductors. A single high-energy electron emitted from a radioactive atom can produce 200,000 slower electrons in the bombarded semiconductor, thereby establishing an electric current. The socalled *atomic battery* announced last year is an example. Although still in the research-and-development stage, with power measured only in millionths of a watt, progress is continuing toward units of greater capacity. Initial applications contemplated are for miniature devices like hearing aids, pocket-size radio receivers, signal controls and similar devices for which extreme compactness, reliability and great length of service are important. Conceivably the atomic battery, and the solar battery as well, might some day be combined with electronic refrigeration for comfort air conditioning.

Two other aspects of nuclear technology may be mentioned. Proposals to use radioactive fission products, recoverable from spent fuels after removal from nuclear reactors, received publicity a year or two ago

as a potential heat source for residential heating. Also, there has been speculation on the possibilities for direct production of electric power from energy contained in the atom, without passing through a conventional heat-power cycle. Both these subjects are reviewed in the mentioned report of the McKinney Panel. In brief, they are considered to hold little promise for tangible applications to residential air conditioning within the foreseeable future.

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Conclusion

The outlook for continued expansion and diversification of residential air conditioning was never brighter. Electronic cooling is but one of many avenues being explored that will lead to novel systems and to improved components and combinations for systems currently in use. Energy resources will surely be augmented by the expanding research programs and by the developments aimed at making solar radiation and nuclear energy universally available. However, economic factors will require as careful attention as the technical problems involved.

NEW NAME FOR CONTRACTORS

It has been announced that the *Heating, Piping and Air Conditioning Contractors National Association* will henceforth operate under its new name of *Mechanical Contractors Association of America, Inc.* The Association continues to occupy its quarters at 30 Rockefeller Plaza, New York, and it is hoped that the change in name will result in more effective service to the members of the association and also will more nearly describe the field covered by their activities.

SOCIETY COMMITTEE MEETINGS

Recent meetings of Society committees include that of the Public Relations Committee which met September 21 in Chicago. Also, the Charter and By-Laws Committee met on September 24 in New York. There was also a meeting of the Guide Advisory Committee on September 21 in Chicago, as well as a meeting of the *ASRE*-ASHAE Joint Committee on Cooperation. On September 20, the Committee on Arrangements for the 1957 Annual Meeting met in Chicago. Also at Chicago on September 22, the Long-Range Planning Committee and the Executive Committee of Council met. At its meeting on September 23 in Chicago, the Finance Committee of Council gave consideration to the 1957 Budget. The Committee on Research met at Cleveland on September 20. The Standards Committee met on August 29 in New York. The Joint Committee on Standards for Comfort met in New York on August 30.

It is expected that the Fall meeting of Council will take place in Chicago on October 21, at which time the Budget for 1957 will be a subject for final consideration.

ASSISTANCE ON LOCAL CODES

At a meeting of the Standards Committee on August 29 in New York consideration was given to the subject of making assistance available to Society members and committees concerned with the preparation of local, state and national regulations. Discussion brought out the point that often members who are preparing local regulations have little information on procedures or on the material to be included in the proposed code. It seemed desirable, therefore, that the Society should formulate some procedure concerning these situations with a view toward assisting local committees.

It was decided that a Standards Advisory Committee should be established as a first step in working out such a program. It is planned that the Advisory Committee should include the following items in its consideration of the subject:

1. A compilation of National Standards suitable for use in local regulations.

2. A recommendation to the Standards Committee on codes needed to supplement present Society codes.

3. A compilation and analysis of various existing local ordinances to determine the desirable character and scope for such regulations.

4. An examination of enabling ordinances such as offered to communities by *RISAC, NFPA, NWAH&ACA* and other groups.

5. A recommended program of action for the Standards Committee.

CHARTERS FOR TWO NEW CHAPTERS

Following Council action granting charters to 2 new member groups, charters were presented recently at organization meetings called for the purpose.

As a result, the Illinois-Iowa Chapter is the 64th to be organized and covers the Quad-Cities and Peoria, Ill. The charter was presented at a meeting in the Le Claire Hotel in Moline, Ill., on September 19.

Pres. John W. James, Chicago, Ill., acted as the installing officer and principal speaker. Present also were 2nd Vice Pres. E. R. Queer, University Park, Pa.; Executive Secy. A. V. Hutchinson, New York, N. Y.; and John E. Haines, Minneapolis, Minn., regional director.

Members who served as officers during the organizational period are: Pres. Robert L. Graham, Rock Island, Ill.; Treas. Everett O. Hull, Peoria, Ill.; Secy. Donald H. Ninow, Moline, Ill.

The New Orleans Room of the Del Camino Restaurant in El Paso was the meeting place where the charter was presented to the 65th (El Paso) Chapter on October 4.

On this occasion also, President James was installing officer and principal speaker; Executive Secy. A. V. Hutchinson was present and D. M. Mills functioned as regional director.

Members who served as officers for this group during the formative period of the chapter were: Pres. J. Otis Le Beau, Jr.; Vice Pres. George Jackson; Secy. J. H. Brooks; Treas. J. A. True.

NEW OFFICE LIGHTING GUIDE

A new *IES Recommended Practice for Office Lighting* has just been released by the *Illuminating Engineering Society*, the first report on this important lighting subject since 1947. Prepared by that Society's Committee on Office Lighting, the new report includes results of consultation over the past six years with representatives of the *IES* Committee on School Lighting, the *American Institute of Architects*, and the National Council for Schoolhouse Construction. The new *Recommended Practice* is 32 pages in length, completely illustrated, and with much of the valuable information arranged in tabular form for easy reference, making it an excellent manual for anyone concerned with the problem of office lighting.

Individual copies are 50c each and may be obtained from Publications Office, *Illuminating Engineering Society*, 1860 Broadway, New York 23, N. Y.

Papers, Symposiums Planned for Annual Meeting

ASHAE Meets In Chicago Feb. 25-28

Symposiums on Industrial Ventilation and Dehumidification, as well as 14 papers on diversified subjects, have been arranged by the Program and Papers Committee, W. A. Grant, chairman, for the 63rd Annual Meeting of the Society in Chicago, February 25-28, 1957. Simultaneously with the opening of the 63rd Annual Meeting will be that of the 13th International Heating and Air-Conditioning Exposition, under the auspices of the Society, in Chicago's famous International Amphitheatre. ASHAE registration headquarters will be in the Conrad Hilton beginning Sunday, February 24, at 10:00 a.m. The Exposition will open Monday afternoon at 2:00 p.m. and close Friday at 6:00 p.m. It will remain open every day until 10:00 p.m., except Friday.

Looking north on Michigan Ave., Wrigley Building is at left

The Program

The balanced selection of subjects for the Annual Meeting program includes papers on panel heating, heat pump underground coil design, cooling tower packings, solving thermal circuits by analogue computer, outside design temperatures in the United States, air cleaning, and the characteristics of downward air jets.

C. H. Pesterfield is making the arrangements for the symposium on Industrial Ventilation and expects to have a group of men well-versed on this subject comprising the panel. They will discuss industrial environ-

Transportation Rates* to Chicago, Ill. from Chapter Cities

City	Round Trip By Air	1st Class Round Trip By Rail	One Way Roomette	City	Round Trip By Air	1st Class Round Trip By Rail	One Way Roomette
Albany, N. Y.	$ 85.70	$ 73.82	$12.40	Memphis, Tenn.	$ 63.80	$ 33.40	$ 8.80
Albuquerque, N. M.	139.80	82.60	21.75	Milwaukee, Wis.	11.40	5.25	1.05
Atlanta, Ga.	78.10	50.95	12.40	Minneapolis, Minn.	48.50	24.95	7.55
Austin, Tex.	130.40	70.60	18.40	Montreal, Canada	105.90	69.25	13.45
Baltimore, Md.	71.90	68.83	12.40	Newark, N. J.	85.70	80.80	13.45
Baton Rouge, La.	106.00	57.20	14.50	New Orleans, La.	106.00	57.60	14.95
Battle Creek, Mich.	19.00	15.62	7.55	New York, N. Y.	85.70	81.59	13.45
Boston, Mass.	102.30	92.88	14.95	Norfolk, Va.	88.30	72.70	13.90
Buffalo, N. Y.	57.00	47.30	8.80	Oklahoma City, Okla.	85.90	49.15	12.40
Charlotte, N. C.	81.70	64.85	16.45	Omaha, Nebr.	52.60	30.50	8.80
Cincinnati, Ohio	33.50	27.62	7.55	Ottawa, Canada	92.00	62.74	12.40
Cleveland, Ohio	38.00	31.66	7.55	Philadelphia, Pa.	79.00	73.50	12.40
Columbia, S. C.	89.30	66.30	14.50	Phoenix, Ariz.	182.10	112.60	28.60
Columbus, Ohio	38.80	29.35	7.55	Pittsburgh, Pa.	51.80	42.55	7.55
Dallas, Tex.	107.00	58.45	15.50	Portland, Ore.	218.10	120.75	31.60
Dayton, Ohio	30.50	27.62	7.55	Sacramento, Calif.	218.10	132.80	31.60
Denver, Colo.	110.40	65.45	16.00	St. Louis, Mo.	31.50	77.90	7.55
Des Moines, Ia.	58.70	21.95	7.55	Salt Lake City, Utah	161.80	91.45	21.75
Detroit, Mich.	30.90	26.72	7.55	San Antonio, Tex.	134.90	75.70	19.35
Edmonton, Canada	199.00	100.50	23.15	San Francisco, Calif.	218.10	132.80	31.60
El Paso, Tex.	160.10	87.55	21.75	Seattle, Wash.	218.10	120.75	31.60
Greensboro, N. C.	75.20	68.25	16.45	Shreveport, La.	100.70	55.65	14.50
Hartford, Conn.	93.30	85.60	14.90	Spokane, Wash.	195.20	101.90	27.25
Houston, Tex.	128.50	72.90	17.95	Springfield, Mass.	93.30	85.60	13.45
Indianapolis, Ind.	20.90	17.51	7.55	Syracuse, N. Y.	71.90	60.64	9.85
Jackson, Miss.	86.20	46.40	12.40	Toledo, Ohio	28.00	21.18	7.00
Kansas City, Mo.	49.70	28.15	8.20	Toronto, Canada	58.90	41.90	8.20
Little Rock, Ark.	79.10	41.45	9.85	Tulsa, Okla.	72.90	43.30	12.40
Los Angeles, Calif.	218.10	132.80	31.60	Vancouver, Canada	255.20	120.75	31.60
Louisville, Ky.	34.10	28.35	7.55	Washington, D. C.	71.90	68.83	12.40
Lubbock, Tex.	120.10	68.85	19.35	Wichita, Kans.	72.00	41.20	12.40
				Winnipeg, Canada	97.30	51.25	12.40

*Above rates subject to 10% tax; also subject to change without notice.

Chicago Skyline with Conrad Hilton at left

ment, cleaning industrial effluent, local and general atmospheric contaminants control and summer-winter comfort ventilation for industry.

John Everetts, Jr., is planning an equally outstanding panel discussion on Dehumidification. The subjects which will be covered in the symposium include dehumidification by refrigeration, solid sorbents and liquid sorbents; also the economics of dehumidification and the solutions to typical problems.

In addition to the papers and symposiums, the officers and various committees will present their annual reports.

The Exposition

According to E. K. Stevens of the International Exposition Co., which manages the Exposition, this will be the largest exhibit of equipment ever held anywhere in the world. The Society's own exhibit, Booth 701, is a completely new presentation of ASHAE activities and will feature a backdrop 20 ft high, emphasizing that Society members are Engineers of Human Comfort. Divided into three sections, the exhibit will illustrate the membership, research and publication endeavors of the Society for the advancement of professional knowledge.

Illinois Chapter

The Committee on Arrangements for the Illinois Chapter, with P. J. Marschall as general chairman, is working on a series of special events which it is believed will be of interest and provide pleasure for all members, their families, and guests. Chapter president H. G. Gragg is assisting Mr. Marschall as vice chairman. Honorary chairmen are Society past presidents H. M. Hart, S. R. Lewis and A. C. Willard.

The Committee on Arrangements has been divided into three divisions headed respectively by G. Gill Freyder, *Ticket Reservations;* J. S. Kearney, *Entertainment;* Herbert Kreisman, *Hospitality*. The chairman of the various committees are M. W. Bishop, *Reception;* E. P. Heckel, Jr., *Finance;* Mrs. H. G. Gragg, *Ladies;* R. W. Roose, *Publicity;* G. V. Zintel, *Banquet;* L. O. Paul, *Sessions;* H. C. Stevens, *Transportation;* R. J. Salinger, *Registration;* J. C. Scott, *Inspection Trips;* E. R. Teske, *Information;* H. J. Couch, *Facilities.*

Accommodations

Hotel reservation forms were sent to all members in August and it was suggested that the forms be sent to the hotel selected as soon as possible. In addition to the Conrad Hilton, many other hotels are cooperating for the comfort and convenience of those attending the 63rd Annual Meeting and 13th International Heating and Air-Conditioning Exposition. The typical transportation rates to Chicago from the various Chapter cities are published in this issue of the Journal. It is advisable that travel reservations be made well in advance to avoid disappointment.

The Annual Meeting, the Exposition, a fine program of special events planned by the Illinois Chapter Committee on Arrangements, and the city of Chicago with its numerous and beautiful parks, public buildings and places of entertainment, all add up to what will make a memorable occasion for all those present in Chicago February 25 to March 1, 1957.

The members of the Illinois Chapter look forward to welcoming a large attendance of Society members, their families and friends.

BIOLOGICAL EFFECTS OF ATOMIC RADIATION

Two separate bulletins have been issued each dealing with the subject of the biological effects of atomic radiation. One booklet contains a summary of the first technical findings and recommendations of 6 committees established to carry on a continuing study of the biological effects of atomic radiations from the points of view of genetics, pathology, meteorology, oceanography and fisheries, agriculture and food supplies, and the disposal and dispersal of radioactive wastes. This bulletin contains sufficient technical information, especially the section on meteorology, to be of technical interest to many members. The other bulletin is in the form of a report to the public and is prepared in nontechnical style. Copies of both bulletins are available, free of charge, through the Publications Office, National Academy of Sciences, National Research Council, 2101 Constitution Ave., Washington 25, D. C.

Nominations for 1957

In accordance with the provisions of the Society's By-Laws, proxy ballots containing the names of the candidates will be sent to the membership prior to the Annual Meeting in February.

Report of Nominating Committee

The Nominating Committee, selected in accordance with the provisions of **Article VIII**—*Section* 3 of the By-Laws, has submitted the following nominees for Officers and members of Council for 1957:

President
P. B. GORDON, New York, N. Y.

First Vice President
E. R. QUEER, University Park, Pa.

Second Vice President
A. J. HESS, Los Angeles, Calif.

Treasurer
C. H. PESTERFIELD, East Lansing, Mich.

Members of Council *(Three-Year Term)*

R. S. DILL, Washington, D.C.
W. G. HOLE, Montreal, Que., Canada
P. J. MARSCHALL, North Chicago, Ill.
W. O. STEWART, Los Angeles, Calif.

Respectfully submitted,
NOMINATING COMMITTEE

J. Donald Kroecker, *Chairman*
B. L. Evans, *Secretary*

G. C. F. Asker	Henry Kleinkauf
J. S. Burke	B. M. Kluge
L. A. Childs	G. A. Linskie
C. F. Hoffman	H. B. Nottage
B. J. Horsburgh	W. B. Pennock

Alternate
G. B. Supple

Council Nominees for Committee on Research

The election of the Committee on Research is governed by the By-Laws for the election of Officers, with the exception that members of the Committee on Research are nominated by the Council.

In accordance with the provisions of **Article VII** — *Section* 3 *(h)* the Council announces the nomination of the following members of the Committee for election to succeed those members whose present terms expire January 1957.

Committee on Research *(Three-Year Term)*

D. D'EUSTACHIO, Port Allegany, Pa.
E. S. HOWARTH, New Kensington, Pa.
H. R. LIMBACHER, Kalamazoo, Mich.
E. F. SNYDER, JR., Minneapolis, Minn.
J. I. TRIMBLE, Columbus, Ohio

One-Year Term
P. H. YEOMANS, Philadelphia, Pa.

By-Law Provisions on Nominations and Voting

Article VII

Section 3. General Committees. .....
(h) Committee on Research, consisting of fifteen (15) MEMBERS, nominated by the Council or as provided in *Article VIII, Section 4*, and elected by the Society in the manner of elected officers. .....

Article VIII

Section 4. Other Nominations. Nominations of officers and members of the Council, other than those nominated by the Nominating Committee, and nominations of members of the Committee on Research, other than those nominated by the Council, may be made in writing by at least fifty (50) members eligible to vote, upon presentation of such nominations, with each nominee's consent, to the Executive Secretary at least sixty (60) days prior to the opening of the first session of the Annual Meeting, whereupon the nominees' names shall be placed upon the ballot with a notation that they are presented by members independent of the Nominating Committee.

Section 5. Voting. Voting at any meeting may be in person or by proxy, but only the Executive Secretary and MEMBERS of the Society shall be eligible to act as proxies. Proxies shall not be valid for more than three (3) months from dates of execution. The Executive Secretary and the MEMBERS acting as proxies shall hold the ballots of their principals secret and confidential. Voting for election of officers, Council members, members of the Committee on Research, on proposals to amend these By-Laws, and on questions required to be referred to the Society persuant to *Article V, Section 2*, shall be by secret ballot. In the event of any tie vote, the Council shall decide the vote.

Section 6. Ballots. Together with notice of the Annual Meeting, the Executive Secretary shall forward appropriate proxies and ballots to members entitled to vote. The proxies and ballots shall contain spaces for write-in names.

Biographies of 1957 Nominees

Officers

For President — P. B. GORDON, vice president, Wolff and Munier, Inc., New York, who is now ASHAE first vice president, became a junior member of the Society in 1935, advancing to full member in 1944. He served a 3-year term on the Council beginning in 1952, and was second vice president of the Society in 1955.

He was born in Montclair, N. J., in 1907. While an undergraduate at Rutgers

P. B. Gordon
New York, N. Y.

University, Mr. Gordon began work as a draftsman and estimator. After graduating with a B.S. in civil engineering in 1928, he worked with a New Brunswick contractor for a year. He then joined George E. Gibson Co., New York, later assuming charge of the heating and ventilating department. From 1936 on he has been connected with Wolff and Munier, Inc., acting as engineer, treasurer and director previous to gaining the vice presidency in 1951.

Mr. Gordon also has given courses in air conditioning at Brooklyn Evening Technical High School, was an instructor and adjunct associate professor at New York University Evening Engineering Division, and was a visiting lecturer in mechanical engineering at Princeton University.

Active on various Society committees, Mr. Gordon has served on the following: the Guide Publication Committee, as member from 1949-50 and chairman in 1951; TAC on Panel Heating and Cooling, as member, 1947-49 and 1956, and chairman, 1949-55; Standards Committee, as member, 1952-53, and chairman in 1954; Program and Papers Committee, 1952-53; Building Committee, 1953-56; Ways and Means Committee, 1954; ASHAE-*ASRE* Committee on Cooperation, 1954-55; Long-Range Planning Committee, 1953-54, and chairman, 1955; and chairman of the Chapter Relations Committee last year. A member of the Executive Committee in 1955, he is presently serving that Council committee as chairman, as well as being chairman of the F. Paul Anderson Committee, and a member of the Guide Advisory Committee and the ASHAE-*AIA* Committee on Cooperation.

Mr. Gordon received the Distinguished Service Award for 1956 of the *HP&ACCNA* and also holds membership in *ASME*, *ASRE*, *ASEE* and The Chemists' Club of New York. He is listed in *Who's Who in America*.

For First Vice President — E. R. QUEER, director and professor of engineering research, The Pennsylvania State University, University Park, Pa., is presently serving the Society as second vice president, and was treasurer in 1953 and 1954. He has been a member of Council since 1950.

Professor Queer was born in Johnstown, Pa., in 1904. A student of electrical engineering at Pennsylvania State College, he received his B.S. in 1926 and M.S. in 1928. He has been associated with the College of Engineering and Architecture in the field of research since graduation, serving on the faculty since 1926, and as director of engineering research since 1952. The author of a number of bulletins and technical papers, he has conducted extensive research, particularly in the fields of heat and moisture transfer, thermodynamics, adsorption by chemical desiccants, and in housing.

Professor Queer holds the rank of captain in the U. S. Naval Reserve. During World War II, he served for 5 years in the Air Conditioning Section of the Bureau of Ships, receiving commendations from Adm. C. W. Nimitz and J. A. Forrestal, Secretary of the Navy. He now acts as a consultant to the Chief of Army Ordnance, the Bureau of Yards and Docks of the U. S. Navy, the U. N. Permanent Headquarters on condensation control in the United Nations Buildings, and several architect-engineer firms on long-term storage and preservation of military material on thermal insulation, and on protective coatings.

E. R. Queer
University Park, Pa.

Since he joined the Society in 1933, he has been on various committees, among which were the Technical Advisory Committees on Navy Studies, and on Air Sterilization, 1948; Insulation, 1939-49; and Human Calorimetry, 1949-56. For the past 3 years, he has been a member of the Executive Committee and the ASHAE-*ASRE* Committee on Cooperation. He also served on the following: Committee on Research, 1948-50; Admission and Advancement, 1945-47, and as chairman, 1947-48; Federal Liaison, 1949; Program and Papers, chairman, 1951-52; Ways and Means, 1952 and 1954-55, and chairman, 1953; and Finance Committee, 1952-54,

A. J. Hess
Los Angeles, Calif.

and chairman, 1955. He is the current chairman of the Regions Central Committee, composed of regional directors, and of the Honors and Awards Committee.

Registered as a professional engineer in the State of Pennsylvania, Professor Queer is also a member of the *Society of Naval Architects and Marine Engineers*, United States Naval Institute, *American Society of Naval Engineers*, *ASTM*, Sigma Xi and Theta Xi. He is a member of the Cosmos Club, Washington, D.C., and is listed in *Who's Who in Engineering*.

For Second Vice President—ARTHUR J. HESS, president, Hess-Greiner & Polland, Los Angeles, Calif., is now completing a 3-year term as a member of the ASHAE Council and is regional director of Region 4.

Since 1936 Mr. Hess has been engaged in the application and sale of engineering products. Projects on which he has worked include the stages at the 20th Century-Fox Studio; the heating, ventilating and air conditioning for the Co-op wind tunnel at Pasadena and at Curtiss-Wright; and the Earhart Research Laboratory, California Institute of Technology.

Mr. Hess was born in Pasadena in 1904. He studied civil engineering at the University of California at Los Angeles and at Berkeley, and the University of Southern California. In 1928 he entered business as a plumbing and heating contractor. From 1930 to 1936 he was a consulting engineer, concurrently teaching night courses for the Los Angeles Board of Education.

A member of the Society since 1937, Mr. Hess has been an active leader of the

Southern California Chapter. He was elected president of the chapter in 1941, having previously served as treasurer, secretary and vice president.

His service to the Society includes chairmanship of the Chapters Conference Committee, 1952; and membership on the Committee on Promotion of Research, 1949; Chapter Relations Committee, 1950-52 and 1955; and Long-Range Planning Committee, 1953-55. Mr. Hess, who served on the Committee on Research from 1950-53, has held membership on the TAC on Corrosion, 1950; on Air Cleaning, 1951-55; and on Sensations of Comfort, 1949-56. Currently a member of the TAC on Evaporative Cooling, he acted as chairman of that body from 1953-55, and has been chairman of the TAC on Plant and Animal Husbandry since 1953. Chairman of the Program and Papers Committee last year, he is presently chairman of its Advisory Sub-committee, and is also chairman of the Finance Committee, of which he was a member for the past 2 years.

A past president of *ASRE*, Mr. Hess was selected as an *ASRE* representative for the ASHAE-*ASRE* Committee on Cooperation. He is also a member of the *Air Pollution Control Association*, Free and Accepted Order of Masons, Shriners, Kappa Alpha, and Chi Epsilon.

Mr. Hess is the author of several articles, including Air Conditioning in Moving Picture Studios, Evaporative Cooling, Air Conditioning in Film Laboratories, and Plant Research in the Phytotron. He is listed in *Who's Who in Commerce and Industry*.

For Treasurer — CHARLES H. PESTERFIELD, professor of mechanical engineering, Michigan State University, East Lansing, Mich., has been continuously associated with the University for the past 19 years. Professor Pesterfield, who joined the Society in 1932, is a member of Council, currently finishing a 3-year term, and is the regional director of Region 2.

He was born in 1907 in Van Buren, Ark. In 1931, he was graduated from the University of Arkansas with a B.S. in mechanical engineering. Prior to graduation, he worked as a research assistant for the university in its experimental engineering laboratory. During 1932-33, he did graduate work at the University of Minnesota as a Society research fellow, and in 1933 he received his M.S. in mechanical engineering from the same university.

C. H. Pesterfield
East Lansing, Mich.

The following year, Professor Pesterfield was appointed an instructor of mechanical engineering at the University of North Dakota. From 1935 to 1938 he was acting head of the University's Department of Mechanical Engineering. In the latter capacity he supervised the design and installation of the departmental power plant. In 1938 he accepted an appointment as instructor at Michigan State College. Subsequently, he has held an assistant professorship, associate professorship, and is currently a full professor in charge of refrigeration and heating and air conditioning option.

Meanwhile, he has acted as management consultant for several industries, banks and department stores since 1944.

Professor Pesterfield has been active on the following committees of the Society: Admission and Advancement in 1940; Nominating, 1945-47, and chairman, 1949; Chapter Delegates Committee alternate, 1945-46 and 1948, and member, 1947; and Chapter Relations Committee, 1948 and 1953. He has been a member of the Program and Papers Committee since 1954, and of the Standards Committee for the past 2 years.

Affiliated with the Western Michigan Chapter, Professor Pesterfield has served on the chapter's Board of Governors for 3 years, 1940-41 and 1944. He was elected secretary of the chapter in 1939, vice president in 1942 and president in 1943.

Other societies and fraternal organizations of which Professor Pesterfield is an active member are the Sigma Xi and Tau Beta Pi, honorary societies of scientific research and engineering.

He is one of the authors of the paper on Resistance of Rectangular Divided-Flow Fittings, which appeared recently in the Journal, as well as the author of many other technical publications.

Members of Council
(*three-year term*)

R. S. Dill
Washington, D. C.

RICHARD S. DILL, chief, Heating and Air-Conditioning Section, National Bureau of Standards, Washington, D.C., has been connected with the Bureau since 1928. For the first 5 years of his employ he worked in the Automotive Section, testing automobile engines, accessories, fuels and lubricants. He became a member of the Heat Transfer Section in 1933 and assumed his present position in 1941.

The author of numerous technical papers, Mr. Dill's writings cover such subjects as A Test Method for Air Filters, A Survey of Testing Methods and Rating Limits for Domestic Heating Devices, and The Freezing of Water in Pipes and Vessels.

Mr. Dill was born at New Bern, N.C., in 1901. He received a B.S. in mechanical engineering from North Carolina State College of Agriculture and Engineering in 1923. After graduation, he worked for a few years in the engine estimating department of the Newport News Shipbuilding & Drydock Co.

A member of the Society since 1939, Mr. Dill served as a member of the Committee on Research, for 6 years and chairman for 2 years, 1953-54. He has been chairman of the Publication Committee, Guide Publication Committee, and TAC on Air Cleaning. He has also held membership on the Technical Advisory Committees on Instruments, Fuels and Combustion, Weather Design Data, Panel Heating, and Physiological Research, as well as the Standards Committee. Presently he is serving on the ASHAE Committee on Code for Testing and Rating Heavy Duty Furnaces.

He is a past president of the Washington, D.C., Chapter of ASHAE, and is a member of *ASME*, *ASRE*, *ASTM*, the Washington Academy of Sciences, and the Free and Accepted Order of Masons. Mr. Dill is a registered engineer in the District of Columbia, and is listed in *American Men of Science*.

W. G. Hole
Montreal, Que., Canada

WILLIAM G. HOLE, vice president, American Air Filter of Canada, Ltd., Montreal, has been a member of the Society since

1942. He served on the Chapters Conference Committee for 1951, and was a member of the Nominating Committee in 1953, and an alternate of that committee last year.

His home town is Edmonton, Alberta, where he was born on December 20, 1910, and attended Victoria High School. He received a B.Sc. in civil engineering from the University of Alberta in 1933. Then, he went to England for further study at the University of London.

Mr. Hole entered the heating and air-conditioning field in 1935, when he became a draftsman for J. Jeffries & Co., Ltd., London. He also worked for 4 years as manager of Warren Webster & Co., Ltd., in London, before returning in 1940 to Canada, where he became associated with T. Pringle & Son, Ltd., Montreal. The following year he joined Darling Brothers, Ltd., Montreal, where he did engineering work on air filtration and dust control. He began his present association with American Air Filter of Canada, Ltd., in a managerial capacity in 1952.

A member of the Montreal Chapter, Mr. Hole was elected as treasurer for 1947, and later served as vice president, 1951, and president, 1952. Other organizations to which he belongs are the *Engineering Institute of Canada, Professional Engineers of Quebec, McGill Graduate Society*, and Mount Royal Curling Club.

PETER J. MARSCHALL, manager of engineering, Abbott Laboratories, North Chicago, Ill., is in charge of his company's engineering department, and utilities and maintenance divisions. He joined the Society in 1927.

Mr. Marschall has always lived in or near Chicago, where he was born on June 18, 1901. He was graduated from Armour Institute of Technology with a B.S. in electrical engineering in 1924. For some months after graduation he worked as a

P. J. Marschall
North Chicago, Ill.

student engineer at the Public Service Co. of Northern Illinois.

His career began in 1925 when he was employed by E. Vernon Hill Co., Chicago. During this association, he acted as a consulting engineer, and wrote articles for the *Aerologist*, a publication of that firm which later was merged with *Heating, Piping & Air Conditioning*. Nine years later, he transferred to Kroeschell Engineering Co., Chicago, and worked on the design, sale and supervision of installations. Before his affiliation with Abbott Laboratories in 1942 as chief engineer, he served the Austin Co. as assistant to

W. O. Stewart
Los Angeles, Calif.

project engineer on the design of the Douglas Aircraft Plant, Park Ridge, Ill.

Society committees which Mr. Marschall has served include the Guide Publication Committee, 1949-51, and the Publication Committee, of which he was chairman from 1952-53. Back in 1937 he was a member of the TAC on Relation of Body Changes to Air Changes, and since 1953 he has been a member of the TAC on Physiological Research and chairman of the TAC on Industrial Environment. Also for the past 4 years he has been a member at large of the Joint Committee on Standards for Comfort Air Conditioning. The Illinois Chapter selected Mr. Marschall as its president for 1950, after he had served as treasurer and vice president. He is general chairman, Committee on Arrangements, 63rd Annual Meeting.

Mr. Marschall holds membership in the Production and Engineering Section of the *American Drug Manufacturing Association*, Michigan Shores Club, and is a past president of the Northwest Men's Club, a civic organization in Wilmette, Ill. He has just completed a term as president of the Loyola Academy Fathers' Club.

Last year he wrote the May Research Page for the Journal, entitled *Control of the Industrial Environment*.

WESLEY O. STEWART has been manager of the Los Angeles Branch of the Johnson Service Co. since 1937. He joined the Society in 1938 and served as a member of the Nominating Committee in 1954 and last year was secretary of that committee.

He was born in 1905 at Plymouth, Mich. In 1928 he received a B.S. in architectural engineering from the University of Michigan. Following graduation, Mr. Stewart began as a draftsman and junior engineer for Eric F. Hyde of Detroit. Later, he joined the R. L. Spitzley Heating Co., Detroit, as an engineer. California projects which he worked on after he became associated with the Johnson Service Co. include Walt Disney Productions, Burbank; Douglas Aircraft Co., Inc., Long Beach; Goodyear Synthetic Rubber Plant, Torrance; and Naval Ordnance Test Station, Inyokern.

In addition to his service for the Nominating Committee of the Society, Mr. Stewart was a member of the Chapters Conference Committee from 1942 to 1943. His name has appeared on the Chapter Speakers' List for the past few years. He is affiliated with the Southern California Chapter, which he served as treasurer, secretary, vice president and president successively from 1939 to 1942.

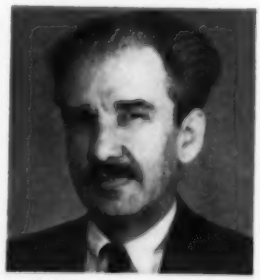
His memberships in other organizations include the Free and Accepted Order of Masons, Rotary Club of Los Angeles, and the Alpha Kappa Lambda Fraternity, University of Michigan.

Committee on Research
(*three-year term*)

DOMINIC D'EUSTACHIO, head, physics section, Research and Development Division, Pittsburgh Corning Corp., Port Allegany, Pa., was a member of the Technical Advisory Committee on Heat Flow Through Glass from 1952 to 1955. He is on the Chapter Speakers' List.

He was born in Pittsburgh, Pa., in 1904. A graduate of Columbia University with an A.B. in 1926, he received his PhD. in Physics from New York University 10 years later. He was a research associate at Columbia University from 1927-29. The following year he went to New York University as an assistant, later becoming an instructor in the physics department. In 1936 he transferred to the Polytechnic Institute of Brooklyn, first as an instructor and then professor of physics.

During the war Mr. D'Eustachio worked with the Signal Corps and with Bliley Electric Co., Erie, Pa., on problems connected with design and production of



D. D'Eustachio
Port Allegany, Pa.

quartz crystal oscillation. Since 1947 he has been associated with Pittsburgh Corning Corp.

Besides being a member of the Society since 1952, Mr. D'Eustachio is a fellow of *AAAS* and a member of *APS*. He is co-

author of A Study of a Transient Heat Method for Measuring Thermal Conductivity, in the 1952 TRANSACTIONS.

ELBERT S. HOWARTH is the chief of the Mechanical Engineering Division, Alcoa Research Laboratories, Aluminum Company of America, New Kensington, Pa., a position held for the past 4 years.

Mr. Howarth, who was born in 1915, studied at Carnegie Institute of Technology, receiving his B.S. in mechanical engineering in 1936 and M.S. in mechanics in 1939. He joined the Aluminum Company of America in 1936 as a mechanical engineer engaged in testing, research, design and development. As chief of the Metal Working Division, a post which he gained in 1943, he did research work on metal working operations, as well as heating, piping and air-conditioning research. When he was named chief of the Mechanical Engineering Division in 1952, his work was extended to research and design in the mechanical engineering field. He was chairman of Alcoa's Piping Committee, which was responsible for all applications of aluminum in the piping and air-conditioning systems of the 30-story Alcoa Building in Pittsburgh, Pa.

Since joining the Society Mr. Howarth has served as a member of the Technical

E. S. Howarth
New Kensington, Pa.

Advisory Committee on Panel Heating and Cooling. From 1953 to 1954 he was a member of that committee's Group B, Heat Transfer Between the Panel and the Space. Mr. Howarth also holds membership in *ASME*, the *American Society for Metals*, and The Scientific Research Society of America. He is a registered engineer in Pennsylvania.

In collaboration with other authors he prepared the technical paper on Aluminum Ceiling Panels for Heating and Cooling, which appeared in the 1951 TRANSACTIONS. He is listed in *Who's Who in Engineering*, and *American Men of Science*.

HOWARD R. LIMBACHER, chief design engineer, Ingersoll Conditioned Air Division, Borg-Warner Corp., Kalamazoo, Mich., is now completing a 3-year term on the Committee on Research.

He was born in Dover, Ohio, in 1904, and attended The Ohio State University, Columbus, where he received his B.M.E. in 1936. Mr. Limbacher was employed as a research engineer by Battelle Memorial Institute, Columbus, Ohio, from 1935-43. He then joined the staff of the Borg-Warner Corp. as a development engineer in the Ingersoll Steel & Disc Division, later the Ingersoll Products Division.

A member of the Society since 1943, he served for many years as a member or alternate on the Chapters Conference Committee, and was a member of the Guide Committee from 1948-50. For the past 2 years he has been a member of the Research Executive Committee and Long Range Research Program, as well as vice chairman of the TAC on Air Distribution

H. R. Limbacher
Kalamazoo, Mich.

and chairman of the TAC on Combustion, of which he had been a member since 1950.

He was president of the Western Michigan Chapter in 1952-53 and its vice president in 1951 and secretary in 1948-49.

Mr. Limbacher, who is a licensed engineer in the State of Ohio, is the author of several papers including Performance of Automatic Controls of Small Underfeed Stokers; An Experimental Investigation of the British Standard Method for the Crucible Swelling Test for Coal; The Relation of the Size of Bituminous Coals to Their Performance on Small Underfeed Stokers; and The Performance of Several Types of Bituminous Coal on Small Underfeed Stokers.

In addition to ASHAE, Mr. Limbacher is also a member of *ASME*, *Kalamazoo Engineering Society* and Tau Beta Pi. He is listed in *American Men of Science*.

E. F. Snyder, Jr.
Minneapolis, Minn.

EDWIN F. SNYDER, JR., supervisor, Control Application Commercial Division, Minneapolis-Honeywell Regulator Co., Minneapolis, Minn., is currently finishing a three-year term as a member of the Committee on Research.

Mr. Snyder, who was born in 1914 in Grand Rapids, Mich., received his B.S. in mechanical engineering from the University of Michigan in 1936.

He started his career in 1930 as assistant superintendent and heating engineer with the Rudy Furnace Co. He worked intermittently while attending school and remained with the firm until 1938. From 1940-41 he was superintendent and chief engineer for the Season-Aire Corporation of America. Mr. Snyder served in the Army from 1941-45, supervising the design and construction of 8 air bases, with the 101st Airborne Division. He became associated with Minneapolis-Honeywell in 1945.

Joining the Society in 1940, Mr. Snyder became a member of the TAC on Panel Heating and Cooling, Group D, in 1951, serving as chairman from 1952-53, and is a member again this year. Vice chairman of the TAC on Air Cleaning from 1954-55, he is now serving as chairman of that committee, and has been a member of the Long Range Research Program for the past 2 years. He was president of the

J. I. Trimble
Columbus, Ohio

Minnesota Chapter in 1951-52, vice president in 1950-51 and secretary, 1948-50.

The author of several articles, he also co-authored a 2-part paper on Field Studies of Floor Panel Control Systems, appearing in Transactions, 1953-54. In addition he wrote a paper on Control of The Heat Pump, published in 1951, and one recently published on Self-Actuated Room Control from High Speed Air.

Mr. Snyder is a member of the Triangle Fraternity, Michigan Chapter.

JOHN I. TRIMBLE, manager, product engineering and development, Janitrol Divisions, Surface Combustion Corp., Columbus, Ohio, has been with that company since 1928. He joined the Society in 1945.

He was born in McKeesport, Pa., in 1905. A student of electrical engineering, he attended Carnegie Institute of Technology and the University of Florida.

Mr. Trimble was first employed in the engineering department of Surface Combustion Corp., Toledo, Ohio. Starting as a laboratory assistant, he progressed to junior sales engineer. In 1931 he was

named district sales manager of the Pittsburgh territory, which then covered West Virginia, eastern Ohio, western Pennsylvania, western New York and Ontario, Canada.

He returned to Columbus and to engineering as manager of the space heating engineering department in 1938. His current position as manager of product engineering and development covers both the Heating and Air Conditioning, and Aircraft Automotive Divisions.

(One-Year Term)

PAUL H. YEOMANS, consulting engineer, Philadelphia, Pa., was born in Unionville, N.Y., in 1897. He received a B.S. in mechanical engineering from the University of Pennsylvania in 1920. In the early years after graduation, he worked as a heating engineer for Warren Webster & Co., Camden, N.J., and as a sales engineer for John J. Nesbitt, Inc., Holmesburg, Pa.

Mr. Yeomans taught heating and ventilating, and physics in Philadelphia schools for a few years prior to joining Socony Burner Corp., New York, N.Y., in 1926. Two years later, he became associated with Armstrong Cork Co., Lancaster, Pa., and was responsible for engineering in connection with heating, ventilating and air-conditioning problems for domestic plants. In 1944 he became a sales engineer for Carrier Corp., Philadelphia. Mr. Yeomans left Carrier Corp. to begin practice as a consulting engineer. His firm was known as Walker-Yeomans Associates, Inc., until recently.

In 1955 he served as a member of the Technical Advisory Committee on Cooling Load, and this year is a member of the TAC on Heating and Air Conditioning Loads. Currently, Mr. Yeomans is also the

P. H. Yeomans
Philadelphia, Pa.

first vice president of the Philadelphia Chapter. He previously served that chapter as a member of the board of governors, secretary, treasurer, and second vice president in the consecutive years from 1952 to 1955. Two years ago he was an alternate member of the Chapters Conference Committee.

He was a member of the American Business Club of Lancaster, and is now a member of the Engineers Club of Philadelphia, the *Engineering and Technical Societies Council*, Kiwanis Club of Philadelphia, and *Pennsylvania Society of Professional Engineers*, holding registration in Pennsylvania and New Jersey. He is presently completing an unexpired term on the Committee on Research.

ACTIVITIES OF SOCIETY CHAPTERS

Programs

RECENT chapter meeting programs mostly featured varied technical talks, frequently given by a guest speaker. . . .The newly chartered AUSTIN Chapter heard a discussion of the Austin Master Plan given by the chairman of the citizens committee on the plan, John Broad, Broad Construction Co., Austin. Mr. Broad, who has worked with different groups on city planning since 1927, explained how the city of Austin's original master plan had become outdated and described the land, population and financial factors requiring consideration in a new plan. He enlivened his talk by distributing a number of charts and maps among his listeners. . . . Colored slides and recorded commentary on *Moisture in Refrigeration Systems* highlighted a presentation before the BATON ROUGE Chapter by L. T. Flanner, Allied Chemical and Dye Corp., Baton Rouge. . . .Addressing the IOWA Chapter, W. E. Nanes, consultant for refrigeration and air conditioning, Des Moines, Ia., gave a description of Iowa's largest air-conditioning system at the Des Moines Register and Tribune Building. Following the meeting, members and guests enjoyed a tour of inspection of the building's air-conditioning system. . . .*Predicting the Performance of Warm Air Heating System Operation with Cooling Coils Installed* was the title of a KANSAS Chapter program presented by W. G. Rundell, supervisor, application and service, The Coleman Co., Inc., Wichita, Kans. . . .H. E. Voegeli, development engineer, American Brass Co., Waterbury, Conn., spoke to the MINNESOTA Chapter on *Stored Solar Heat and the Heat Pump*. Interesting angles were brought out on heat pump applications and on the use of the sun's rays in connection with heat pump application, which Mr. Voegeli referred to as *bridling the sun*. . . .MONTREAL Chapter members and guests viewed a film on the dangers of improper boiler safety protection. Also included on the program was an entertaining film for devotees of curling, the Canadian sport. . . .The interrelation of air conditioning and medicine was discussed before a meeting of the NORTH TEXAS Chapter by Dr. W. F. Miller. He discussed the physiological adjustments made when a person passes from an air-conditioned environment to a hot outside temperature, the use of cold in certain surgical procedures, and the relationship of clothing and body resistance.

Elections

Election results announced at recent chapter meetings include the following:

BALTIMORE: W. G. Robertson, Jr., president; R. E. Dressell, vice president; C. E. McCaffray, secretary; W. C. Hossfeld, treasurer. Board of Governors: G. M. Heslop, E. J. Morris, Y. S. Smith.

IOWA: D. E. Schroeder, president; W. A. Schworm, vice president; R. T. Howard, Jr., secretary-treasurer. Board of Governors; H. E. Drain, G. J. Kraai, H. A. Schwieger.

KANSAS: H. M. Skalla, president; T. L. Roberts, vice president; J. C. Mikesell, secretary; E. L. Oswald, treasurer.

OTTAWA VALLEY: D. W. Banton, president; C. W. Watson, vice president; Jacob Klassen, secretary; A. H. Hargreaves, treasurer. Board of Governors: G. A. Gray, A. S. Lawson.

ST. LOUIS: W. P. Norris, president; N. J. Hubbuch, vice president; K. O. Williams, secretary; J. J. Blackmore, treasurer. Board of Governors: E. T. Clucas, A. W. Felt, W. C. Kaber, E. C. Kuntz, J. I. Levenhagen, C. K. Meyers.

SOUTH TEXAS: J. C. Lewis, president; A. B. Ullrich, Jr., vice president; E. B. Appling, secretary; W. A. Sharp, treasurer. Board of Governors: H. D. McMillan, Jr., J. H. Stephenson.

Personalities

A Life Membership certificate was presented to W. S. Wunderlich by Pres. E. T. Erickson of the MINNESOTA Chapter. . . The presentation of awards for winning essays by senior engineering students at McGill University and Ecole Polytechnique were made at a MONTREAL Chapter meeting by Professors Bruce and Bouthillette to Stewart Kerby and Michel Brillon, respectively. . . .C. W. Watson, secretary, OTTAWA VALLEY Chapter, read a letter of appreciation received from Dr. J. Willis, Indian and Northern Health Services, Department of National Health and Welfare, for the gift of toys sent to the Moose Factory Indian Hospital. . . .Pres. E. T. Clucas of ST. LOUIS Chapter advised his fellow members that L. W. Moon, a member for 41 years and editor of the original chapter publication, would be moving to Florida. . . .G. W. Brandt and M. E. Cheshire, recipients of scholarships awarded at the University of Houston, by L. E. Minns, were introduced at a SOUTH TEXAS Chapter meeting and spoke briefly concerning their activities.

EVANS PRESIDENT OF M-H CANADA

W. H. Evans, a Society member, has been elected president of Minneapolis-Honeywell Regulator Co., Ltd., Toronto. He has been general manager since 1941

and vice president and general manager since 1951, and takes over the presidency from Harold W. Sweatt, who has been elected board chairman.

BARNARD IN NEW POST

The appointment of M. E. Barnard, Syracuse, N. Y., as manager of the Unit Heater Department of Carrier Corp. has been announced. The new manager has been a member of the unit heater department since 1929 and sales manager since 1954.

A native Pennsylvanian, he attended public schools in Lancaster, Pennsylvania, and later entered Franklin and Marshall College. He completed his course in business administration at the University of Nebraska.

Mr. Barnard, a member of the Society for 20 years, served on the Committee on Arrangements for its 57th Annual Meeting as chairman of the banquet committee. He is a former president of the Society's Philadelphia Chapter.

NUNLIST AND MUELLER RECEIVE PROMOTIONS

Word has been received that F. J. Nunlist, Jr., has been appointed to the newly created position of executive vice-president of Mueller Climatrol, a Worthington Corp. subsidiary. Also that H. P. Mueller, Jr., vice president, has been named to succeed Nunlist as vice president in charge of sales. Both are members of the Society and Mr. Nunlist is a past president of the Wisconsin Chapter.

Mr. Mueller represents the fourth generation of Muellers to actively participate in company management.

PALMATIER TO MANAGE TRANSPORTATION EQUIPMENT DEPARTMENT

It has been announced that Everett P. Palmatier, director of research at Carrier Corp., has been named manager of the Transportation Equipment Department.

Mr. Palmatier's new work will involve development, manufacture and sale of Carrier's new jet-powered cooling unit for the DC-8 jet airliners, as well as other aircraft air conditioning, and railroad, bus and truck trailer air conditioning and refrigeration.

Walter A. Grant, vice president, research and development, announced that Mr. Palmatier's successor as director of research is Dr. Dewey J. Sandell.

CANDIDATES FOR MEMBERSHIP

Listed here are the names of 61 men who are candidates for membership or advancement in membership grade.

Members are requested to assume their full share of responsibility of receiving these candidates into membership by advising the Executive Secretary before October 31, 1956, of any whose eligibility for membership is questioned. Unless such objection is made these candidates will be voted upon by the Council.

Note: †Reinstatement *Advancement

California (*Region* 4)

McENERY, PATRICK, Pres., Hayes Furnace Mfg. Co., Los Angeles.

Colorado (*Region* 3)

HINES, V. C., Owner, Thermo Tech Products Co., Denver.

McCOY, B. M., Sales Mgr., Edwin P. Cook Co., Denver.

Connecticut (*Region* 1)

ADLER, FRANK, Chief Engr., Standard Sheet Metal Works, Hartford.

CAVANAGH, C. W., Mfrs. Repr., Federal Boiler Co., Inc., Stamford.

Delaware (*Region* 1)

BIGELOW, CHARLES R.*, Cons. Supvsr., E. I. du Pont de Nemours & Co., Inc., Wilmington.

Georgia (*Region* 5)

WHITE, E. F., Engr., Mingledorff's, Inc., Savannah.

Illinois (*Region* 2)

BECHER, C. C., Bldg. Mech. Engr., Illinois Bell Telephone Co., Chicago.

DERRIG, P. M., Chief Mech. Engr., Shaw Metz & Dolio, Chicago.

JOHNSON, O'LEE, Htg. Engr., Moline Heating & Construction Co., Moline.

Indiana (*Region* 2)

BOWMAN, E. F., Promotional Sales Repr., Crane Co., Indianapolis.

MILEY, C. L., Pres., C. L. Miley & Co., Indianapolis.

ORR, T. N.†, Mgr., Htg. Dept., Crane Co., Indianapolis.

Iowa (*Region* 3)

DANTON, R. H., Mech. Engr., Thorson, Thorson & Madson, Archts., Waterloo.

HAWKES, R. W., Dist. Mgr., American Blower Corp., Des Moines.

PETERSEN, D. C., Sales Engr., Minneapolis-Honeywell Regulator Co., Davenport.

SEARS, R. H., Repr., G. E. Mellerup Mfrs. Repr., Des Moines.

Journal Section

Kentucky (*Region* 5)

MASENG, TRYGVE, Cons. Engr., T. Maseng & Assocs., Louisville.

Maryland (*Region* 5)

CASTELL, A. J., Mgr., Burgess-Manning Dept., Hampshire Corp., Baltimore.

Massachusetts (*Region* 1)

FLOOD, E. R., Constr. Analyst, Veterans Administration, Boston.

TABER, PHILIP, Partner, Francis Assocs., Marion.

THOMAS, WILLIAM K., Chief A-C Engr., Fred S. Dubin Assocs., Cambridge.

Michigan (*Region* 2)

ERTMAN, E. C., Mech. Engr., Smith, Hinchman & Grylls, Detroit.

LAYNE, F. M., Partner, Migdal & Layne, Cons. Engrs., Detroit.

Minnesota (*Region* 3)

THOMAS, F. H., Jr., Service Engr., The Trane Co., St. Paul.

Missouri (*Region* 3)

DRACHNIK, JOSEPH, Mech. Engr., Bank Building & Equipment Co., St. Louis.

FITZPATRICK, E. L., Jr., Estimator Engrg., Industrial Heating & Plumbing Co., Inc., St. Joseph.

LAGERSHAUSEN, R. E., Jr., Designer-Draftsman, Toensfeldt-Horch, Cons. Engrs., St. Louis.

LEIPOLD, E. G., Br. Mgr., Peerless Pump Div., Food Machinery & Chemical Corp., St. Louis.

PARKER, J. J., Mech. Engr., Bank Building & Equipment Co., St. Louis.

Nebraska (*Region* 3)

WAIN, M. E., Owner, Wain Engineering Co., Omaha.

New Jersey (*Region* 1)

CARPENTER, R. R., Draftsman-Designer, Hess Fuel Oils, Inc., Perth Amboy.

KNOX, W. T., Asst. Dir., Esso Research and Engineering Co., Linden.

New York (*Region* 1)

BAUMANN, J. H., A-C. Engr., American Gas & Electric Service Corp., New York.

BENESCH, E. J.†, Chief Engr., Syska & Hennessy, Inc., New York.

KLINGHER, M. H., Dist. Mgr., Typhoon Air Conditioning Co., Brooklyn.

STEPHENS, C. J., Htg. & A-C. Designer, U. S. Rubber Co., New York.

WATERFILL, R. W., Vice-Pres., Buensod-Stacey, Inc., New York.

Journal Section

North Carolina (*Region* 5)

PETERSON, S. G., JR., Sales Engr., The Powers Regulator Co., Greensboro.

SHEARON, E. C., Sales Engr., L. R. Gorrell, Raleigh.

Oklahoma (*Region* 6)

ROBINSON, T. L.*, Partner, Davis & Robinson, Cons. Engrs., Oklahoma City.

Oregon (*Region* 4)

AKIN, VERNON*, Designer, Donald Kroeker & Assocs., Portland.

Pennsylvania (*Region* 1)

GRAPIN, GRAHAM, Design Engr., Catalytic Construction Co., Philadelphia.

KOWALSKI, S. J., Engr., Philadelphia Electric Co., Philadelphia.

MATHEIS, R. A., Sales Engr., The Trane Co., Pittsburgh.

STALKER, J. H., Sr. Engr., Catalytic Construction Co., Philadelphia.

TOUCEY, R. M.*, Dist. Mgr., The Trane Co., Pittsburgh.

WEITZEL, P. H.*, Mech. Engr., The General State Authority, Harrisburg.

Texas (*Region* 6)

HATHAWAY, P. L., JR.†, Sales Engr., Ray Co., Dallas.

MCMINN, D. N., Repr., Straus-Frank Co., Houston.

Vermont (*Region* 1)

NOYES, W. O., JR., Pres., Henry M. Tuttle Co., Inc., Bennington.

Wisconsin (*Region* 2)

BEACHAM, E. A., Sr. Engr., Refrig. Sales Dvlpt., Ansul Chemical Co., Marinette.

FREYDER, J. G., Engr. in Training, Modine Co., Racine.

Egypt

SAMI, G. E., Chief Engr., Trane-Egypt, Cairo.

England

TULLY, R. E., Assoc. Partner, G. H. Buckle & Partners, Cons. Engrs., London.

Hong Kong

JONES, L. D., Sr. Engr., China Cold Storage & Engrg. Co., Hong Kong.

Italy

DEL MORO, MARIO, Chief Engr., ASTER, Milan.

New Zealand

FIERZ, WERNER, Designing Draftsman, Heat & Air Control, Ltd., Auckland.

Turkey

CINGIROGLU, R. K., Pres., ALEV Romilos Cingiroglu & Co., Istanbul.

Union of South Africa

GEBER, M. A., Estimating Engr., Airco Engineering, Ltd., Durban.

TIMMERMAN, W. A., Managing Dir., Wanson Company of South Africa, Johannesburg.

OBITUARIES

IN MEMORIAM
Baldwin M. Woods
1887-1956

The Society has received, with very deep regret, news of the untimely death on Friday, September 7, at the age of 68, of Dr. Baldwin M. Woods.

Dr. Woods was president of ASHAE in 1947, an office in which he served with great diligence and distinction, and later as a presidential member he was actively and usefully engaged in Society affairs, remaining on the advisory board until his death. He had retired last year as vice president, university extension department, University of California, where he had been on the faculty for 47 years. He will be greatly missed by his many friends.

Born in Lampasas, Tex., on September 22, 1887, he received his degree in electrical engineering from the University of Texas in 1908. He received his M.S. from the University of California in 1909 and his degree of Doctor of Philosophy from the same university in 1912. Continuing his studies in Europe, Dr. Woods was a student at the Universite de Paris in the fall and winter of 1912 and 1913, and also attended the summer semester at the Universitat zu Munchen in 1913.

Initiating his professional career in 1907 with an assistantship in applied mathematics at the University of Texas, he later went to the University of California as a John W. Mackey, Jr., fellow in electrical engineering in 1908, and served as instructor in mathematics from 1910 to 1914. During the year 1914-1915 he was instructor in theoretical mechanics, and was assistant professor of theoretical mechanics, 1915-1919. He was appointed professor of aerodynamics in 1919 and occupied that position until 1930 when he became professor of mechanical engineering.

Widely experienced as an administrator, Dr. Woods was dean of the summer session in Los Angeles at the University of California from 1921 to 1922, and from 1923 to 1925 he served as assistant dean of the university. He was appointed as associate dean in 1924, was representative in educational relations from 1923 to 1930, which latter year saw him appointed to the chairmanship of the mechanical engineering department. He became director of the university extension department in 1942 and in 1950 was named vice president, university extension, retiring in 1955.

During the first World War, Dr. Woods was president of the academic board and director, U.S. School of Military Aeronautics, University of California, 1917 to 1919, and in the second World War he was vice chairman, University War Council, serving from 1942 to 1944.

In addition to his extensive professional and administrative duties, Dr. Woods undertook heavy responsibilities in local and national affairs. He was a member of the California State Planning Board in 1934, and taking a year's leave of absence from the University of California, he served as consultant in a Survey of Federal Research in the United States with the National Resources Committee in Washington from 1937 until 1938. He maintained relations with the National Resources Planning Board upon his return to the university, serving as chairman of the region covering California, Arizona, Nevada and Utah until it was dissolved by an Act of Congress in 1943. He was chairman of the Water Resources Committee until 1943.

Dr. Woods was a past president of the *American Society of Planning Officials*. He was appointed

federal coordinator, California State Council of Defense, in 1940. A member of the Advisory Committee on Engineering, Science and Management War Training, from 1940 until 1945, he was also chairman of the advisory board for aeronautics for the University of Illinois, 1944 to 1946.

Thoroughly experienced in public relations, Dr. Woods was chairman of the National Committee for the Award of Boeing Scholarships from 1930 to 1938, and chairman, National Committee for the Award of United Air Lines Scholarships, 1939-1942. He served on many *ASME* and *SPEE* special committees and was on the board of awards for the Daniel Guggenheim Medal Fund, Inc., from 1934 until 1937. Dr. Woods served California state committees.

He was the author, in collaboration with Frederick E. Pernot, of a book on logarithms of hyperbolic functions to twelve significant figures, 1916; *Dynamics of Aeroplanes* (with John E. Younger) in 1931; and *Introduction to Engineering Economy* (with E. Paul DeGarmo) in 1942. He also contributed a considerable number of technical and non-technical articles to various publications.

A fellow of the *American Association for the Advancement of Science*, Dr. Woods was also a member of *ASME*, *SPEE*, an honorary member of the *Air Conditioning Society of San Francisco*, a founder member of the *Institute of the Aeronautical Sciences*, a member of the *Engineers Council for Professional Development*, *National Planning Association*, *National University Extension Association*, *Adult Education Association*, *American Association of University Professors*, U. S. Naval Institute and *ASEE*. He was a member of Sigma Xi, and president of its California chapter in 1931, a member of Tau Beta Pi, Alpha Chi Ro, and Phi Delta Kappa and an associate member of Eta Kappa Nu.

Other clubs to which Dr. Woods belonged included the Diable Country Club, the Faculty Club, the Engineers Club, the 100,000 Mile Club of United Air Lines, and the Commonwealth Club of California.

Joining ASHAE in 1937, Dr. Woods became the first president of the Golden Gate chapter, one which he was instrumental in organizing. He was soon active on chapter and Society committees and became a member of Council in 1942. Later, as Society First Vice President, he served as chairman of the F. Paul Anderson Award Committee. He was president of the Society in 1947.

In the course of his long and energetic career he served the Society in the following capacities:

1938	Speakers Bureau
1938-1939	Engineering in its Relation to Public Health
1938-1940	Committee on Research
1939	Committee on Engineering Scholarships
1940-1941	Advisory Committee for Pacific Heating and Air Conditioning Exposition
1940	Executive Committee, Committee on Research
1940-1942	TAC on Cooling Towers, Evaporative Condensers and Spray Ponds (chairman)
1942-1944	Member of Council
1942	Membership Committee
1943	War Service Committee
1944-1946	Finance (chairman)
1945	Research Fund Raising
1946	F. Paul Anderson Award (chairman)
1945	Second Vice President
1946	First Vice President
1947	Executive (chairman)
1948	Advisory Council (chairman)
1948	Public Relations
1949-1956	Advisory Board
1949	Federal Liaison
1950-1952	International Joint Committee on Psychrometric Data (chairman)

Services were held on Monday, September 10, at the First Methodist Church, Oakland. Honorary pall bearers were Admiral Chester Nimitz, Mark Davids, Thomas N. Barrows, Paul H. Sheats, Roy Heffner and L. M. K. Boelter. The In Memoriam address was given by Dr. Robert G. Sproul, president, University of California.

Dr. Woods is survived by his wife, Elizabeth; three sons, Baldwin, Robert, and Ronald; two sisters, Josephine and Eloise; and three grandchildren; to whom the members, Officers and Council extend deepest sympathy.

NORTON W. KINGSLAND
Toronto, Canada

Norton W. Kingsland, 60, an associate member of ASHAE for over 10 years and a past president of the Ontario Chapter, died of a heart attack at his summer home, Tall Timbers, near Parry Sound, Lake Joseph, Ont., on Saturday, August 11.

Mr. Kingsland was editor and publisher

of *Heating, Plumbing & Air Conditioning Age*, Age Publications, Ltd., Toronto, which he founded in 1923. It was then known as *Sanitary Age*. During the Second World War he became vice chairman, Central Heating Committee Wartime Prices and Trade Board, from 1942 to 1943, and National Director of Coal Conservation Dominion Government, Ottawa, from 1943 to 1944.

A man of many interests, Mr. Kingsland was concerned with the founding and development of the *Aeronautical Institute of Canada* and was the founder and one-time president of the *Stoker Institute of Canada*. He was also a past president of the *Business Newspapers Association*.

He belonged to the Tall Timbers Hunt Club, of which he was a former president, and was a member of Victory Lodge, Free and Accepted Order of Masons, No. 547.

Surviving are his wife; his mother, Mrs. Maude A. Kingsland of Ottawa; two sons, Lawrence R. and Peter J. of Toronto; a daughter, Mrs. D. Willoughby, and a brother, W. R. Kingsland of Parry Sound.

ROBERT E. KRAMIG, JR.
Cincinnati, Ohio

A past president of the Cincinnati Chapter of ASHAE, Robert E. Kramig, Jr., died Thursday, July 5, at his cottage near Onekama, Mich., at the age of 53.

Beginning as an estimator with his father's firm, R. E. Kramig & Co., Inc., a company concerned with the selling and erecting of insulating materials, Mr. Kramig emerged as president in 1941 and remained so until his death.

A member of the Free and Accepted Order of Masons, Mr. Kramig also belonged to Sigma Chi, the Rotary Club, the Queen City Club and the Wyoming Golf Club.

He is survived by his father, his wife, and two sons, Robert E. Kramig, III and John N. Kramig.

Mr. Kramig made his home in Wyoming, Ohio.

AMBROSE A. MAYCOCK
Salt Lake City, Utah

The death of Ambrose A. Maycock at the age of 50 of a heart attack while en route to the hospital, occurred on Friday, July 27, in Salt Lake City.

He began his career with the Crane Co. in 1924, subsequently taking charge of their engineers' department. In 1934 he initiated his own firm of A. A. Maycock Co., of which he was president and owner. He was engaged in the design and installation of heating, ventilating, air conditioning and plumbing for many public and commercial buildings. Mr. Maycock was also a director of George Romney & Sons.

Mr. Maycock was the president of the Utah chapter of ASHAE, from 1954 until 1955; a member of the Salt Lake City Chamber of Commerce, the Utah

Journal Section

Building and Construction Congress and the Kiwanis Club.

He leaves a widow, Maureen; a daughter, Marilyn; a step-mother, Mrs. Walter Ranck, Los Angeles, Calif.; two brothers, George E., Jr. and Richard B., both of Salt Lake City; and three sisters, Mrs. Phyllis Doucett, Mrs. Anna Howe, and Mrs. Gertrude Ritchie, all of California.

BENJAMIN H. SNOW
Cambridge, Mass.

Word has been received of the death at 65 of Benjamin H. Snow, a member of the Society since 1951.

Mr. Snow was a graduate in structural engineering from Northeastern University in 1917. His first professional experience was with the Industrial Service and Equipment Co. in 1918, as a structural designer. In the course of his long career he later became assistant plant engineer for the Atlantic Corp., a division manager and engineer with Bernitz Furnace Appliance Co.; sales engineer, Frank E. Ross Co.; chief engineer, General Heat & Appliance Co.; senior engineer, United States Engineering Department, and for over the past 10 years was design engineer for the Delbrook Ventilating Co.

He leaves a widow, Annie; a son, Thomas; and a daughter, Mrs. Harriet Neitz. Mr. Snow resided in Melrose, Mass.

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Western Massachusetts: 1955. Hdqrs., Springfield. PRES, J. E. Reed, 57 Main St., Westfield. SECY, C. R. Munn, 29 Logan St.

MICHIGAN

Michigan: 1916. Hdqrs., Detroit. Meets, 1st Mon. after 10th of month. PRES, J. N. Livermore, 2000 Second Ave. (26). SECY, J. B. Olivieri, 37294 Ilene, Mt. Clemens.

Western Michigan: 1931. Hdqrs., Grand Rapids. Meets, 2nd Mon. PRES, F. L. Murray, 482 W. Michigan Ave., Battle Creek. SECY, R. J. Waalkes, 500 E. 8th St., Holland.

MINNESOTA

Minnesota: 1918. Hdqrs., Minneapolis. Meets, 1st Mon. PRES, E. T. Erickson, 500 Investors Bldg. (2). SECY, I. H. Jester, 621 E. Hennepin Ave.

MISSISSIPPI

Mississippi: 1953. Hdqrs., Jackson. Meets, 4th Mon. PRES, J. W. Doggett, Jr., 254 Kimbrough Dr. SECY, D. F. Ingram, 408 W. Fortification St.

MISSOURI

Kansas City: 1917. Hdqrs., Kansas City. Meets, 1st Mon. PRES, R. M. Spencer, 1510 Main St. SECY, J. E. Miller, 5830 Outlook, Mission, Kan.

St. Louis: 1918. Hdqrs., St. Louis. Meets, 2nd Tues. PRES, W. P. Norris, 6338 Waterman Ave. (5). SECY, K. O. Williams, 3200 Oliver Ave., E. St. Louis, Ill.

NEBRASKA

Nebraska: 1940. Hdqrs., Omaha. Meets, 2nd Tues. PRES, L. J. Paulsen, 1901 S. 39th St. SECY, E. N. Seiler, 1824 N. 53rd St.

NEW JERSEY

North Jersey: 1952. Hdqrs., Newark. Meets, 2nd Tues. PRES, W. C. Kruse, Jr., 183 N. 13th St. (7). SECY, S. H. Nitzberg, P.O. Box 157, Wood-Ridge.

NEW MEXICO

New Mexico: 1954. Hdqrs., Albuquerque. Meets, 3rd Mon. PRES, C. R. Wherritt, 4138-A Trinity Dr., Los Alamos. SECY, R. G. Morryman, 3090 Orange St., Los Alamos.

NEW YORK

Central New York: 1944. Hdqrs., Syracuse. Meets, 4th Wed. PRES, H. J. Morton, 122 Lincoln Ave. SECY, E. L. Moyer, R. D. 2, Jamesville.

Empire State Capital: 1951. Hdqrs., Albany. Meets, 2nd Wed. PRES, G. G. Davis, 111 S. Church St., Schenectady. SECY, M. E. Waddell, 1623 Central Ave.

New York: 1911. Hdqrs., New York. Meets, 3rd Mon. PRES, J. B. Hewett, 64 Buena Vista Dr., Dobbs Ferry. SECY, Carl H. Flink, 62 Worth St. (13).

Western New York: 1919. Hdqrs., Buffalo. Meets 2nd Mon. PRES, V. N. Harwood, 250 Delaware Ave. (2). SECY, J. F. Bedard, 505 Franklin St.

NORTH CAROLINA

Northern Piedmont: 1952. Hdqrs., Greensboro. Meets, 2nd or 3rd Fri. PRES, L. R. Gorrell, 1412 Chester Rd., Raleigh. SECY, C. E. Amick, 1042 Oakmont Ave.

Southern Piedmont: 1952. Hdqrs., Charlotte. PRES, J. A. Rice, 719 E. Worthington Ave. SECY, E. D. Streng, P.O. Box 4083.

OHIO

Central Ohio: 1944. Hdqrs., Columbus. Meets, 3rd Mon. PRES, W. A. Schoonover, 2901 N. High St. (2). SECY, R. C. Liebert, 623 N. High St. (11).

Cincinnati: 1932. Hdqrs., Cincinnati. Meets, 1st Tues. PRES, R. G. Anderson, 1758 Elmore St. (23). SECY, C. P. Krantz, 2308 W. 8th St. (4).

Miami Valley: 1950. Hdqrs., Dayton. Meets, 1st Wed. PRES, J. B. Rishel, 397 W. 1st St. (2). SECY, R. B. Walcott, 2340 E. River Rd. (9).

Northern Ohio: 1916. Hdqrs., Cleveland. Meets, 2nd Mon. PRES, H. R. Canoyer, 1900 Superior. SECY, R. D. Wilson, 2142 E. 19th St. (15).

Toledo: 1954. Hdqrs., Toledo. PRES, J. F. Guest, 1815 N. 13th St. SECY, Robert Greenwald, 2525 Portsmouth Ave. (13).

OKLAHOMA

Oklahoma: 1935. Hdqrs., Oklahoma City. Meets, 2nd Mon. PRES, F. R. Denham, 320 Oklahoma Natural Bldg. (2). SECY, W. R. Johnson, 120 E. Main.

Northeastern Oklahoma: 1948. Hdqrs., Tulsa. Meets, 2nd Tues. PRES, H. W. Meinholtz, Box 2261. SECY, H. L. Cauvel, 3342 East 41st St.

OREGON

Oregon: 1939. Hdqrs., Portland. Meets, Thurs. after 1st Tues. PRES, W. R. Norte, 2225 N. E. Broadway (12). SECY, G. G. Van Alst, 947 S. E. Market.

PENNSYLVANIA

Philadelphia: 1916. Hdqrs., Philadelphia. Meets, 2nd Thurs. PRES, C. J. Lubking, 3345 W. Hunting Park Ave. (32). SECY, Ludwig Mack, 412 W. Hortter St. (19).

Pittsburgh: 1919. Hdqrs., Pittsburgh. Meets, 3rd Mon. PRES, R. M. Toucey, 223 Fourth Ave. (22). SECY, G. E. Smetak, 1238 Brighton Rd. (23).

SOUTH CAROLINA

South Carolina: 1954. Hdqrs., Columbia. PRES, I. E. McMurray, 1639 Blanding St. SECY, A. L. Blackstone, Jr., 1630 Laurel St.

TENNESSEE

Memphis: 1944. Hdqrs., Memphis. Meets, 3rd Mon. PRES, W. L. Henson, 496 S. Main St. SECY, G. B. Ramsey, Jr., 157 Neil St. (3).

TEXAS

Austin: 1956. Hdqrs., Austin. PRES, B. E. Segall, Jr., 705 N. Lamar. SECY, J. L. Rea Jr., 300 W. 8th St., P.O. Box 5206.

North Texas: 1938. Hdqrs., Dallas. Meets, 3rd Mon. PRES, H. G. Gregerson, 4512 Livingston (5). SECY, Ross Zumwalt, 929 Mercantile Securities Bldg. (1).

South Texas: 1938. Hdqrs., Houston. Meets, 3rd Fri. PRES, J. C. Lewis, Box 8188. SECY, E. B. Appling, 4101 San Jacinto St. (4).

Southwest Texas: 1946. Hdqrs., San Antonio. Meets 3rd Tues. PRES, Boone Crisp, Rt. 2, Box 421. SECY, D. T. Kern, 14 Chandler Bldg. (5).

West Texas: 1953. Hdqrs., Lubbock. Meets, 1st Tues. PRES, J. C. Wharton, P. O. Box 1240. SECY, D. G. Halley, 3608 Ave. A.

UTAH

Utah: 1944. Hdqrs., Salt Lake City. Meets, 3rd Thurs. PRES, W. L. Stuewe, 1472 S. State St. (4). SECY, W. C. Leslie, 307 W. 2nd St.

VIRGINIA

Virginia: 1946. Hdqrs., Norfolk. Meets, 3rd Wed. PRES, C. G. Conaway, Jr., 7454 Hank Ave. (5). SECY, E. R. Simpson, Jr., 720 Guy St.

WASHINGTON

Inland Empire: 1950. Hdqrs., Spokane. Meets, 1st Mon. PRES, Max Tonn, 4021 S. Latawah. SECY, R. D. Nevers, E. 124 Augusta, P.O. Box 5026 (21).

Pacific Northwest: 1928. Hdqrs., Seattle. Meets, 2nd Tues. PRES, L. F. Christofferson, 425-1411 Fourth Ave. Bldg. (1). SECY, H. M. Hendrickson, Mech. Engrg. Dept., University of Washington (5).

WISCONSIN

Wisconsin: 1922. Hdqrs., Milwaukee. Meets, 3rd Mon. PRES, H. K. Forfar, 1400 E. Park Pl. (11). SECY, H. W. Snyder, 5520 W. Burleigh (10).

CANADA

British Columbia: 1952. Hdqrs., Vancouver. Meets, 2nd Wed. PRES, D. W. Thomson, 1690 W. Broadway (9). SECY, W. F. Keenan, 54 W. Fifth Ave. (10).

Manitoba: 1935. Hdqrs., Winnipeg. Meets, 4th Thurs. PRES, A. H. Millar, 342 Mandeville St. (12). SECY, R. M. Fraser, 1855 Sargent Ave. (12).

Montreal: 1936. Hdqrs., Montreal. Meets, 3rd Mon. PRES, S. R. Piamondon, City Planning Dept., Smoke Control Division, City Hall. SECY, Arthur DeBreyne, 9 St. Denis St., St. Lambert.

Northern Alberta: 1956. Hdqrs., Edmonton. PRES, W. C. Woods, 13908 116 Ave. SECY, E. K. Cumming, 10249 104 St.

Ontario: 1922. Hdqrs., Toronto. Meets, 1st Mon. PRES, C. J. Bootes, 15 Torbarrie Rd., Downsview. SECY, H. R. Roth, Rm. 407, 57 Bloor St., W.

Ottawa Valley: 1952. Hdqrs., Ottawa. Meets, 3rd Tues. PRES, D. W. Banton, 360 Richmond Rd. (3). SECY, Jacob Klassen, 454 Slater St. (4).

SPECIAL BRANCH

Switzerland: 1952. Hdqrs., Zurich. PRES, Walter Hausler, Erbstrasse 2, Kusnacht. SECY, L. F. de Bruyn, Heschgasse 45.

STUDENT BRANCHES

North Carolina State College: 1948. Hdqrs., Raleigh. PRES, P. K. Tuggle, 407 Gay St., Kannapolis. SECY, G. L. Waitman, 2514 Morganton Rd., Fayetteville.

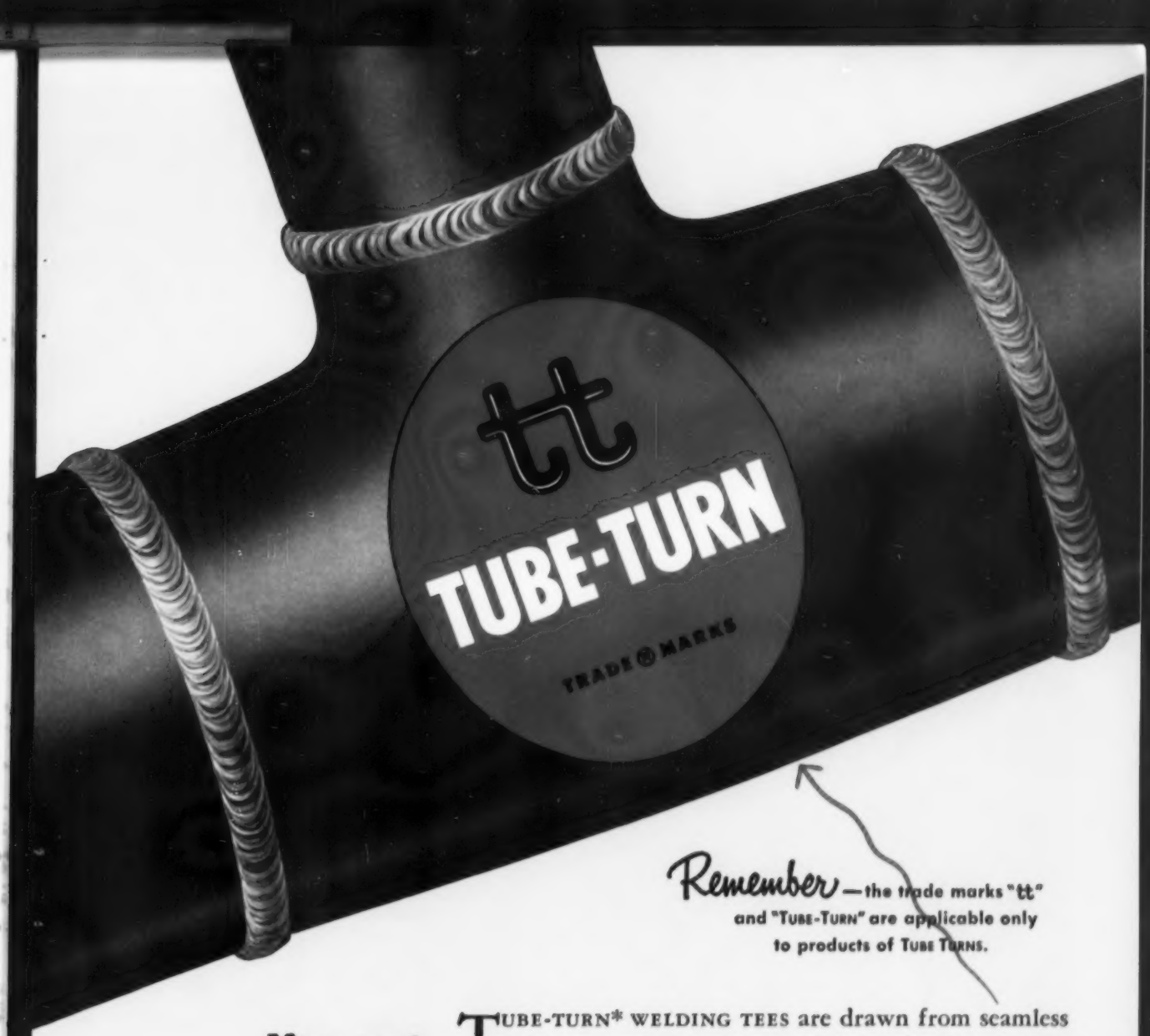
Oregon State College: 1949. Hdqrs., Corvallis. Meets, 1st Wed. after 1st Tues. PRES, P. I. Anderson, 202 N. 10th. SECY, D. W. Strahan, 233 Mall St.

Purdue University: 1948. Hdqrs., W. Lafayette, Ind. PRES, R. F. Puncochar, School of Mech. Engrg. SECY, G. T. Vail, Jr., School of Mech. Engrg.

Texas A. & M. College: 1946. Hdqrs., College Station. Meets, 2nd and 4th Tues. PRES, D. F. Carroll, Box 6264. SECY, C. W. Farrar, Jr., Rt. 1, Box 339, Bryan.

University of Detroit: 1949. Hdqrs., Detroit. Meets, 1st Tues. PRES, L. J. Hayes, Jr., 16254 Santa Rosa Dr. (21). SECY, E. F. Hoelscher, Jr., 14283 Cherrylawn (38).

University of Toronto: 1951. Hdqrs., Toronto. PRES, C. F. Smale, 347 Kennedy Ave. (9). SECY, T. D. Digel, 204 King St., Weston.



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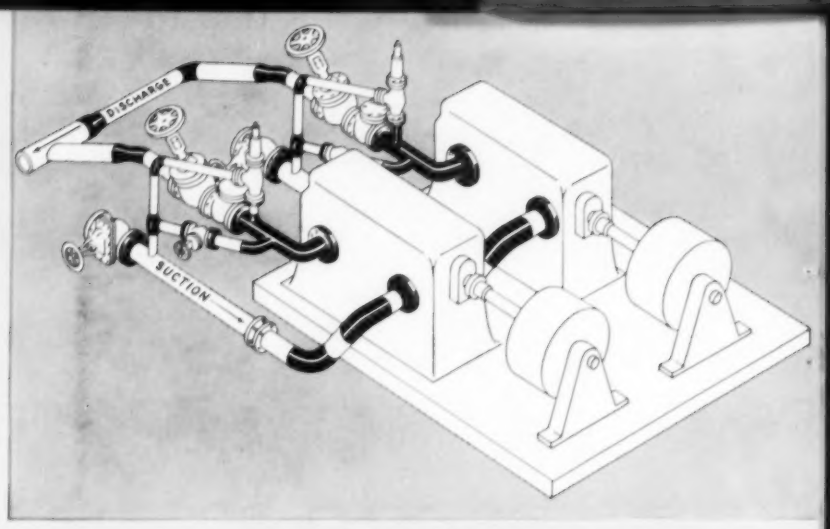

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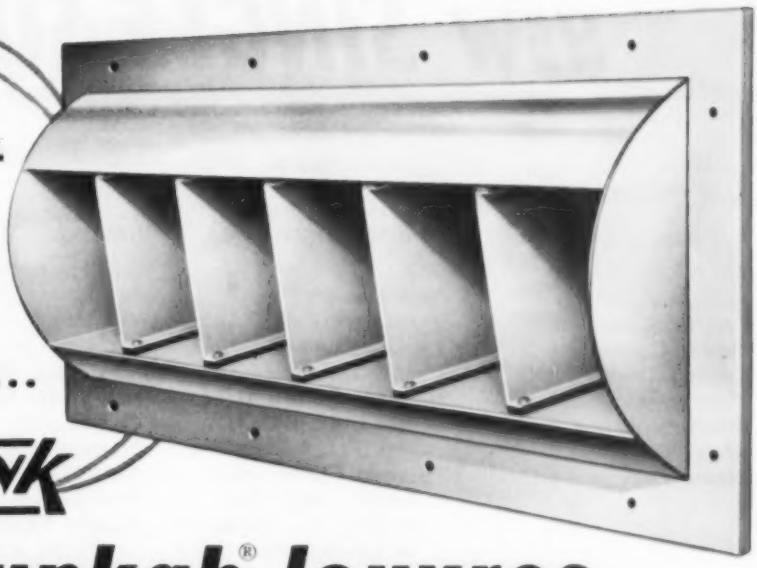
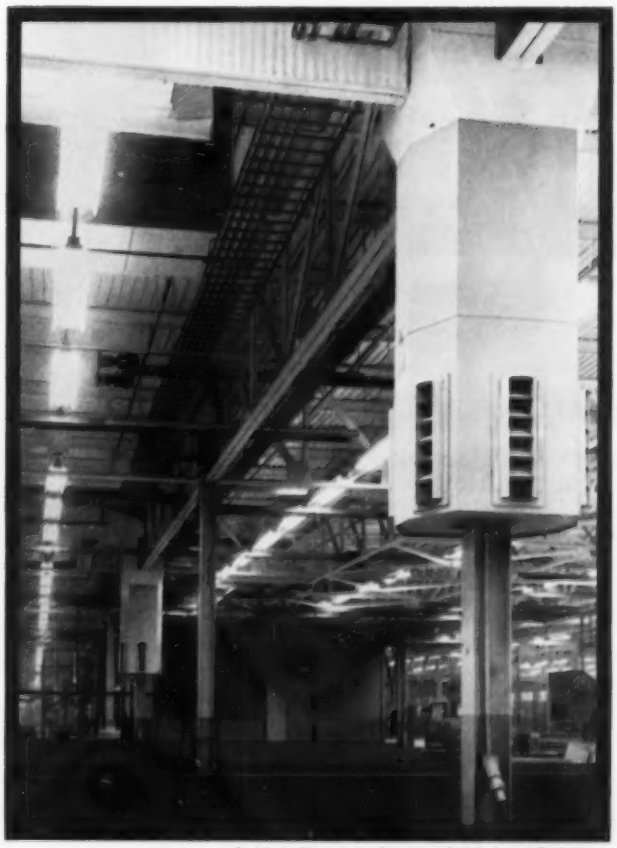


drum punkah® louvres



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FORD MOTOR COMPANY—Sterling Township Machining Plant—Northeast of Detroit
In this new factory, the most advanced of its kind in the world, 500 *drum punkah louvres*, each handling 3,300 C.F.M., have been installed vertically on hexagonal supply plenums. Thousands of these louvres are being installed in other industrial plants throughout the country.

drum punkah louvres have been used for many years in a wide range of commercial and industrial applications and are finding increasing popularity in modern factories where large areas have to be served with a minimum of ductwork.

ADJUSTABLE DRUM AND VANES

The adjustable drum permits variation of the air stream centerline through an included angle of 60°. This feature, combined with adjustable vanes, gives complete directional control of air distribution. The *drum punkah louvre* may be mounted horizontally, or vertically as shown at the left.

HIGH CAPACITY

High outlet velocity combined with large free area gives exceptional capacity for its size.

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The unusually long throw of this unit reduces the amount of branch ducting normally required. High entrainment of secondary air assures thorough mixing of supply air with room air.

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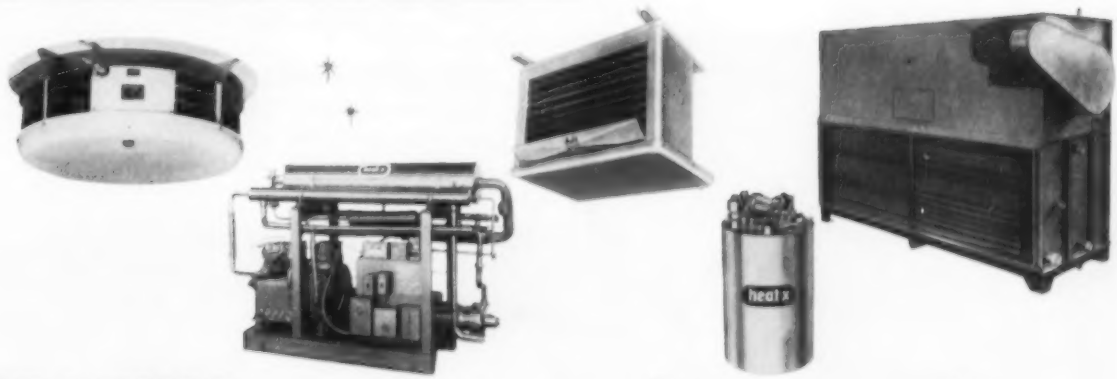

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why engineers go for Gun-Pakt Expansion Joints

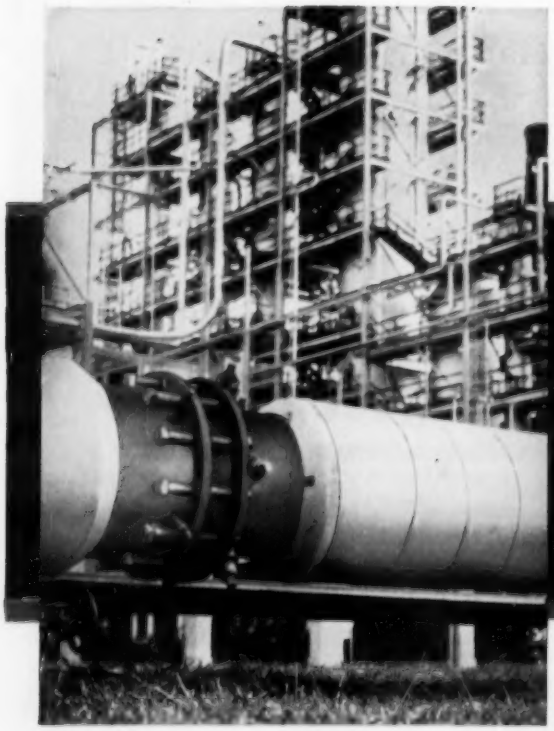
■ Engineers go for Yarway Gun-Pakt Expansion Joints because:

NO SHUTDOWNS. With Gun-Pakt Joints when new packing is needed, it is added under full steam pressure, right on the job—no unpacking, no shutdowns, no service interruptions.

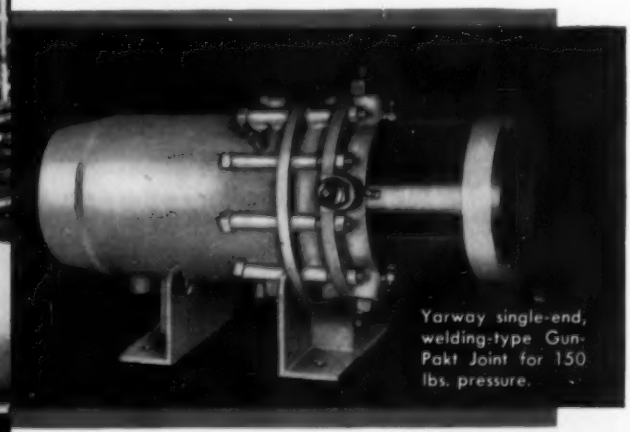
FEWER JOINTS NEEDED. With Gun-Pakt Joints you need fewer joints per length of pipe line, with traverses up to 12" single and 24" double.

LONG SERVICE—NO METAL FATIGUE. Gun-Pakt Joints give long, trouble-free service life—no fatigue failures.

LOW MAINTENANCE. Maintenance records show the costs for servicing Gun-Pakt Joints are very low. One utility reports only 65 cents per year per joint—another reports less than half that.



One of 37 Yarway Gun-Pakt Expansion Joints installed at giant oil refinery on Gulf Coast. Gun-Pakt Joints at this refinery range in size from 1½" to 14".



Yarway single-end, welding-type Gun-Pakt Joint for 150 lbs. pressure.

Leading institutions, central heating stations and industrial plants "go for Gun-Pakt" again and again. Write now for latest bulletin EJ-1914.

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As part of a national network of more than 200 franchised outlets, your nearby Allis-Chalmers Motor Distributor offers the rare combination of *fast service* and a *complete line* of *fine-performance* integral horsepower motors. He's the right man to give you just the right motor — in a hurry.

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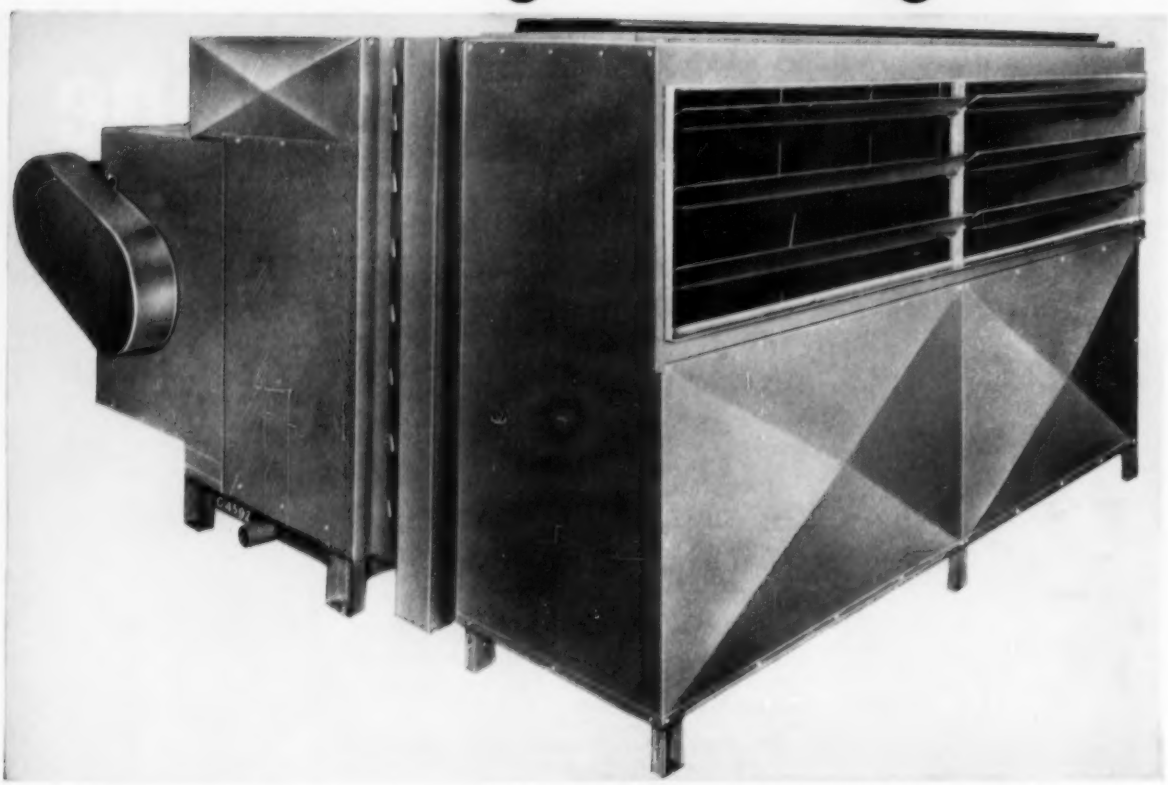
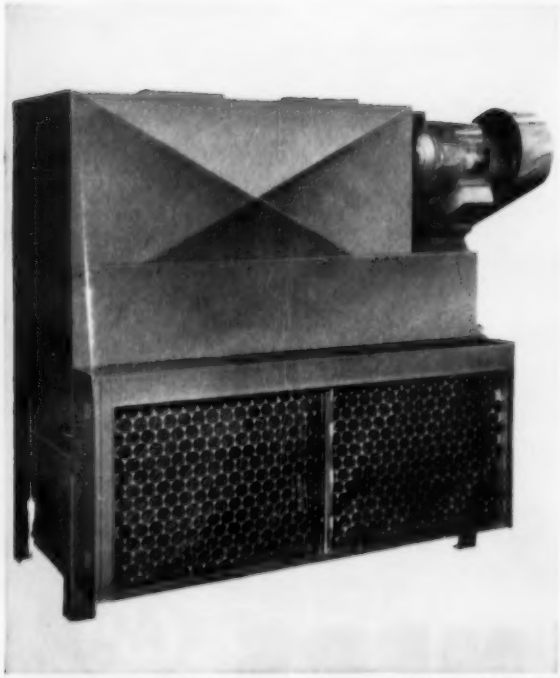
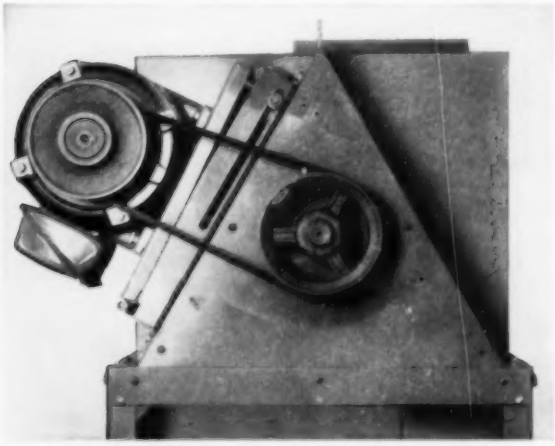


HORIZONTAL CONSTRUCTION of new Worthington air handling units allow them to be suspended from platform or ceiling (with hanger lugs.) Here is a large sized unit with damper section. Standard unit consists of fan section, fans, V-belt, drive (with variable pitch pulley), bypass and damper section, direct expansion or chilled water coils, and base section.



SMALLER SIZED UNITS are shipped completely assembled for horizontal or vertical arrangement shown above.



ADJUSTABLE MOTOR BASE, exclusive with Worthington, offers a 3½" variation in center distance. Adjusted with a single screw, a locking bolt secures base in proper position. This feature assures positive adjustment, enables you to keep belt tension correct. Belt turns on an adjustable pitch pulley which permits variation of fan speed and air quantity.

complete new line of flexible air conditioning units

Compact units—from 1½ to 106 tons—are easy to install—have many exclusive features

Here's a new line of unusually compact air conditioning units for commercial and industrial use in conjunction with central system air conditioning.

Designed by Worthington for easy installation, the standard unit consists of a base section, fan section and coil section. A bypass and damper section can be bolted directly to the coil face at the factory if desired, adding no height to the unit.

Units are extremely flexible. The fan section may be mounted with front, top or rear discharge. You can adjust speed for desired capacity and static pressures. Adjustable motor base offers 3½" variation in center distance for positive adjustment of belt tension. The motor mounts on the front, top, back or either end. Accessories are interchangeable between horizontal and vertical units.

Engineered by Worthington for long, trouble-free life, all sections are constructed of rugged fabricated steel, Bonderized and coated with a corrosion resistant enamel. Dynamically balanced, forward curved fans give maximum efficiency, quiet operation. (Fan shaft rides on lubricated-for-life bearings.)

For more facts on this new line of air conditioning equipment, write Worthington Corporation, Air Conditioning and Refrigeration Division, Section A-6.75-HP, Harrison, N. J.

These features add up to flexibility

- **Exclusive** adjustable motor base assures simple, positive adjustment of belt tension.
- **Motor mounts** on front, back or either end of unit.
- **Fan discharge** can be front, top or rear, as you prefer.
- **Accessories interchangeable** between the horizontal and vertical units.

And look at these extras!

- **Up to 19,000 CFM!** You get more capacity from compact units.
- **Easy installation.** Choose either horizontal or vertical units.
- **Up to 81 different coil** combinations.
- **Lubricated-for-life** fan shaft ball bearings.
- **Accessibility!** Entire fan section can be easily removed. Removable panels and casings simplify inspection and adjustment.

A-6.75

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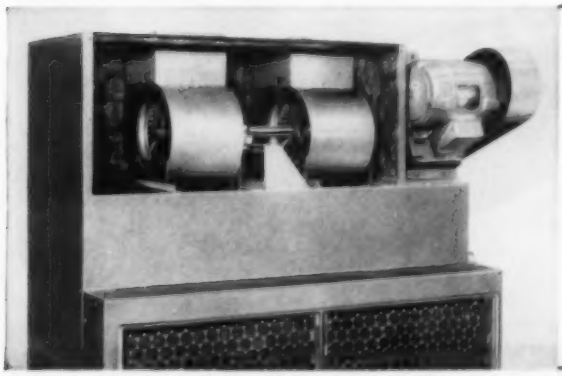
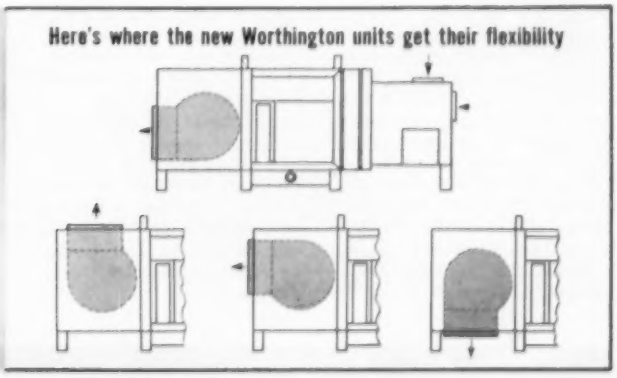
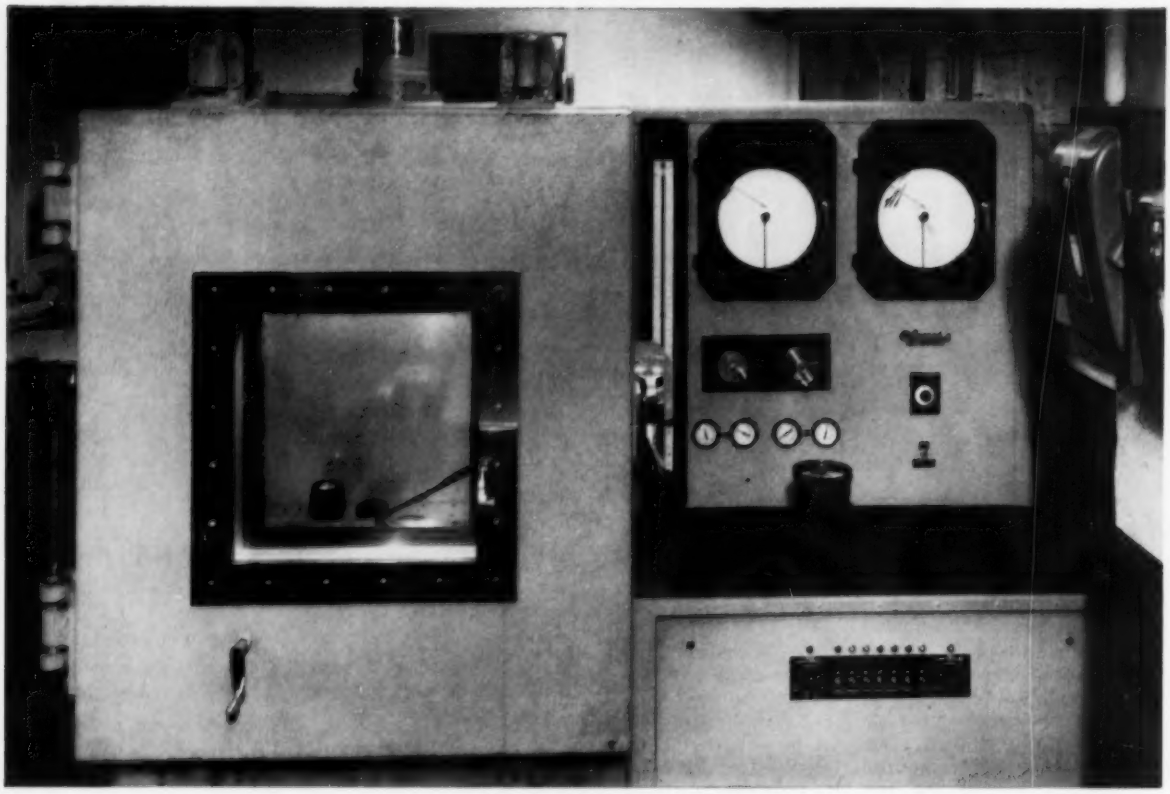




ADJUSTABLE DISCHARGE. Fan section may be mounted with top discharge as shown above. Or discharge may be directed to front or rear of the unit. See diagrams.



How Taylor Instruments help Bausch & Lomb Go up to 80,000 ft. . . Go down to −100°F.

ABOVE . . . and at right . . . you see a part of what scientists at world-famous Bausch & Lomb Optical Co., Rochester, N. Y., call their "Dive and Climb Lab", formally known as the Environmental Testing Laboratory. There optical components and equipment for military and commercial use are tested to determine their suitability for jungle service, high-altitude flying, thermal shock, mechanical shock, vibration and corrosion.

In the test chamber at top, equipment can be subjected to pressures as low as those met at 80,000 feet, to temperatures from minus 100° to +250°F. and to humidities from 18% to 95% within temperatures from 50° to 150°F. The Low Temperature Chamber, (right) located directly opposite the one described above, can go as low as −100°F. Their close proximity affords convenient thermal-shock test facilities.

These "Dive and Climb labs", made by Conrad, Inc., Holland, Michigan, are equipped with Taylor Instruments. Above are a Taylor Pressure Controller with a split scale the equivalent of 100,000 ft. and 30" of mercury, and a Taylor Electronic Contact Wet-and-Dry Bulb Controller. On the Low Temperature Chamber at right is another Electronic Temperature Controller.

If you have a problem of control or measurement, call on the company the specialists call on . . . Taylor Instrument Companies, Rochester, N. Y., or Toronto, Canada.

Taylor Instruments MEAN ACCURACY FIRST

SKIDMORE PUMPS

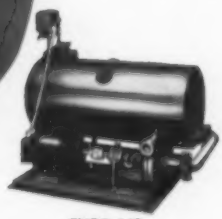
set the pace in performance *

TYPE VC PUMP

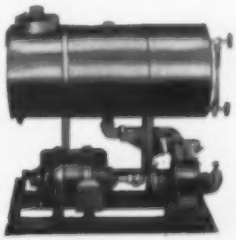
Write for Bulletin No. 10-8

*SKIDMORE PUMPS HAVE SET A STANDARD FOR PERFORMANCE AND DEPENDABILITY SINCE 1921.

TYPE UV
Bulletin No. 19-A



TYPE HS
Bulletin No. 14-A



TYPE TM
Bulletin No. 17

QUIET OPERATION

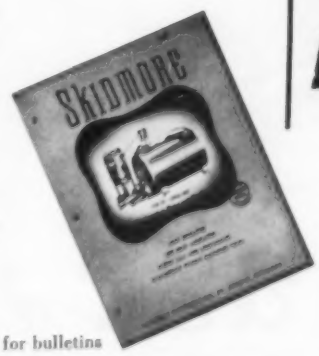
Further evidence of Skidmore's top quality engineering and knowledge of sound design is its quiet operation endowed in every Skidmore Pump.

LOW INLET CONNECTION

Suited to its specified capacities and pressures for efficient operation in every case—pump is provided with low inlet connection to render additional service and reduce installation costs for low floor returns.

ACCESSIBILITY FOR INSPECTION

Like all Skidmore Pumps the VC unit is built for dependability and freedom from troubles—is readily accessible for inspection or service without disturbing pipe connections.



Call your nearest Skidmore Pump Representative or — write for bulletins

SKIDMORE CORPORATION • ST. JOSEPH, MICHIGAN

Leak-free joints made easily with torch and solder.

Section of system ready for paving.

Milwaukee Gas Light Company

MAKES SNOW GO

with Chase Copper Water Tube!

Blizzard snows and freezing rain don't stand a chance around 626 East Wisconsin, in Milwaukee! The Milwaukee Gas Light Company's sidewalks are always free of snow and ice—thanks to an efficient snow removal system of Chase copper tube!

The contractor, John S. Jung, used both Chase Type L copper tube and Chase copper solder-joint fittings in the installation. This combination is unsurpassed for easy, fast installation plus trouble-free performance over the years! You see, corrosion-resistant Chase copper tube comes in long lengths that are easily bent into position and require fewer joints. Tube and fittings are *made for each other,* so leakproof solder-joints are assured. They expand and contract *as one unit* with temperature changes!

Snow everywhere . . . but not around Milwaukee Gas Light Co. building!

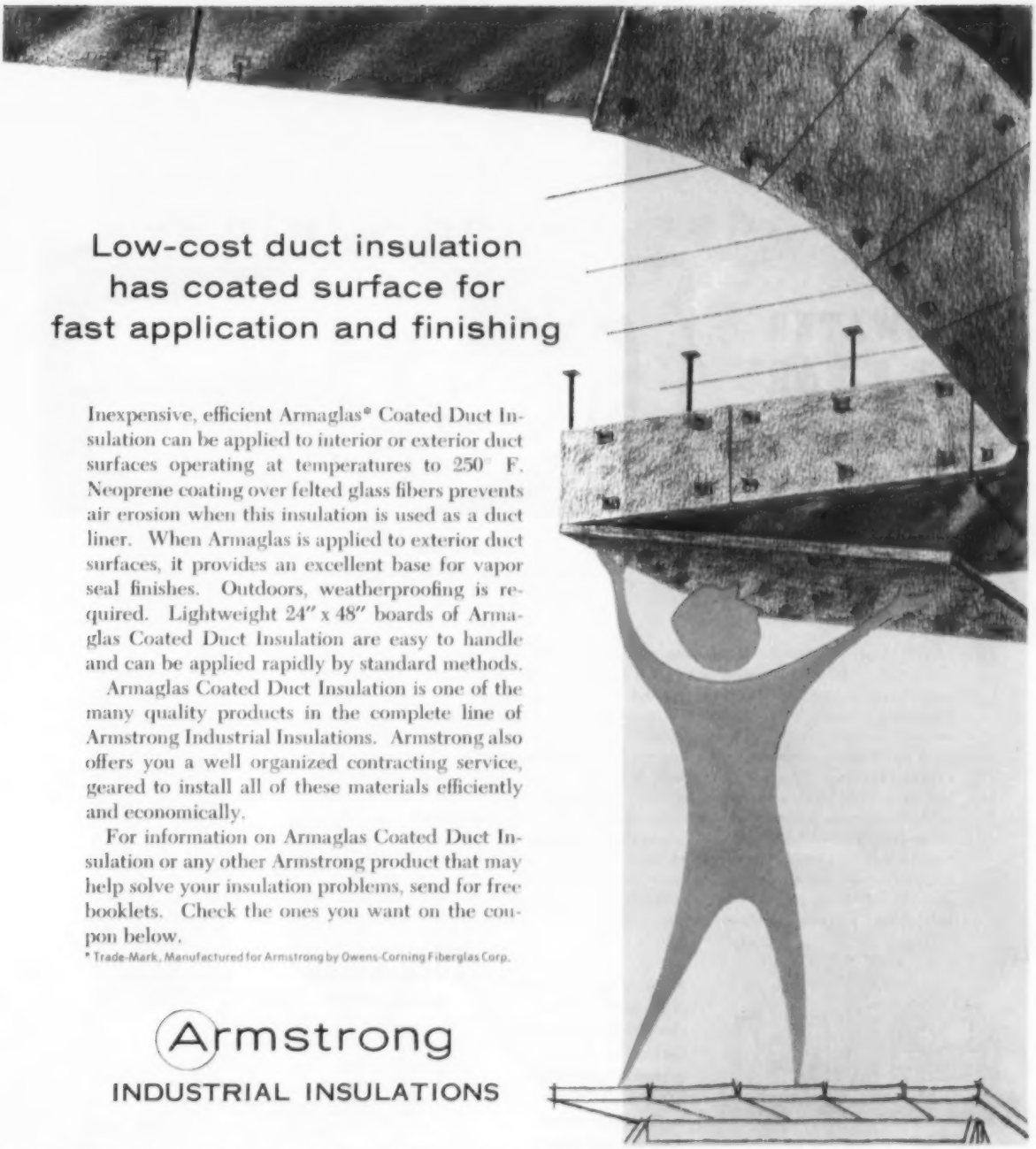
Chase®

BRASS & COPPER CO.

WATERBURY 20, CONNECTICUT • SUBSIDIARY OF KENNECOTT COPPER CORPORATION

The Nation's Headquarters for Brass, Copper & Stainless Steel

Atlanta	Chicago	Denver	Indianapolis	Minneapolis	Philadelphia
Baltimore	Cincinnati	Detroit	Kansas City, Mo.	Newark	Pittsburgh
Boston	Cleveland	Grand Rapids	Los Angeles	New Orleans	Providence
Charlotte	Dallas	Houston	Milwaukee	New York	Rochester
	St. Louis	San Francisco	Seattle	Waterbury	



Low-cost duct insulation has coated surface for fast application and finishing

Inexpensive, efficient Armaglas* Coated Duct Insulation can be applied to interior or exterior duct surfaces operating at temperatures to 250° F. Neoprene coating over felted glass fibers prevents air erosion when this insulation is used as a duct liner. When Armaglas is applied to exterior duct surfaces, it provides an excellent base for vapor seal finishes. Outdoors, weatherproofing is required. Lightweight 24" x 48" boards of Armaglas Coated Duct Insulation are easy to handle and can be applied rapidly by standard methods.

Armaglas Coated Duct Insulation is one of the many quality products in the complete line of Armstrong Industrial Insulations. Armstrong also offers you a well organized contracting service, geared to install all of these materials efficiently and economically.

For information on Armaglas Coated Duct Insulation or any other Armstrong product that may help solve your insulation problems, send for free booklets. Check the ones you want on the coupon below.

* Trade-Mark. Manufactured for Armstrong by Owens-Corning Fiberglas Corp.

Armstrong

INDUSTRIAL INSULATIONS

☐ Armstrong Armaglas Duct Insulations

☐ Armstrong Insulcolor®, Weatherproof Coating in Eight Colors

☐ Armstrong Armaflex®, a New Flexible Insulation for Piping

☐ Armstrong LT Cork Covering, a New Type Cold Line Insulation

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Lancaster, Penna.

Please send me the free booklets checked. ☐

Please have an Armstrong representative call. ☐

Name .....

Position .....

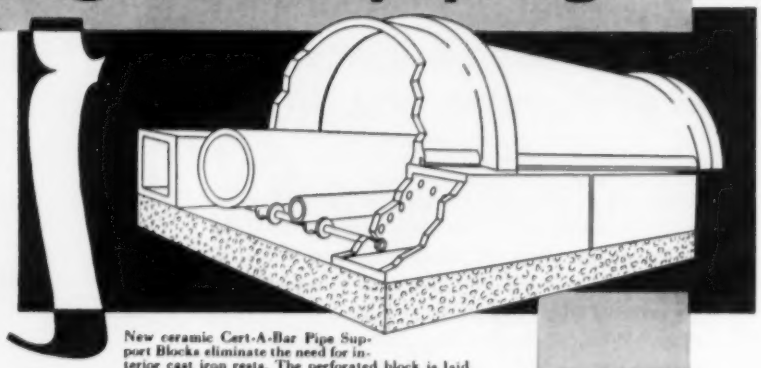
Company .....

Address .....

City ..... Zone .... State .....

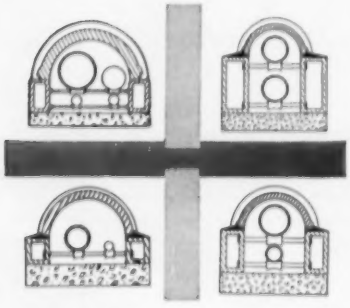
PERMANENT PROTECTION
for underground piping!

STILLWATER CERT-A-BAR* TUNNEL CONDUIT SYSTEM



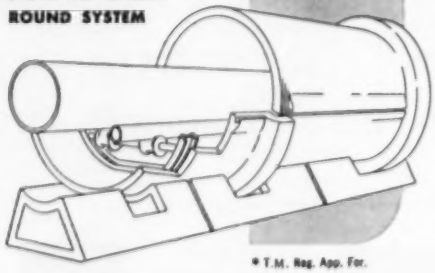
New ceramic Cert-A-Bar Pipe Support Blocks eliminate the need for interior cast iron rests. The perforated block is laid as a structural support member at regular intervals, and the bars are simply inserted and locked in place.

THE vital consideration in selecting an underground conduit system is *permanent* protection . . . not for one year or five, *but for the life of the piping.* You get the best possible protection for your underground metal service piping with a Stillwater Conduit System of vitrified clay. It's chemically inert—can't rust, rot, corrode, or decay . . . ever. And it is manufactured in accordance with ASTM specification C-13-54, assuring proper strength and quality. Any combination of service piping can be protected. Conduit is available in a wide range of sizes, with a complete line of fittings and accessories, including alignment guides, lateral guides, and anchors. Any contractor's crew can handle the installation easily, or if you prefer, Stillwater Licensed Installers will assume the responsibility. The Cert-A-Bar Tunnel System can be installed with any of three suggested new waterproofing specifications—one for average conditions, one for intermittent ground water conditions, and a third for high water table conditions. It's the lowest-cost conduit per year of service that you can specify or install!



A few of the hundreds of possible combinations of piping for the Cert-A-Bar Tunnel System are shown at left. At right is the Lock-A-Bar Round System, used largely for short runs and replacement of other conduit.

LOCK-A-BAR*
ROUND SYSTEM



* T.M. Reg. App. For. Patents Pending.

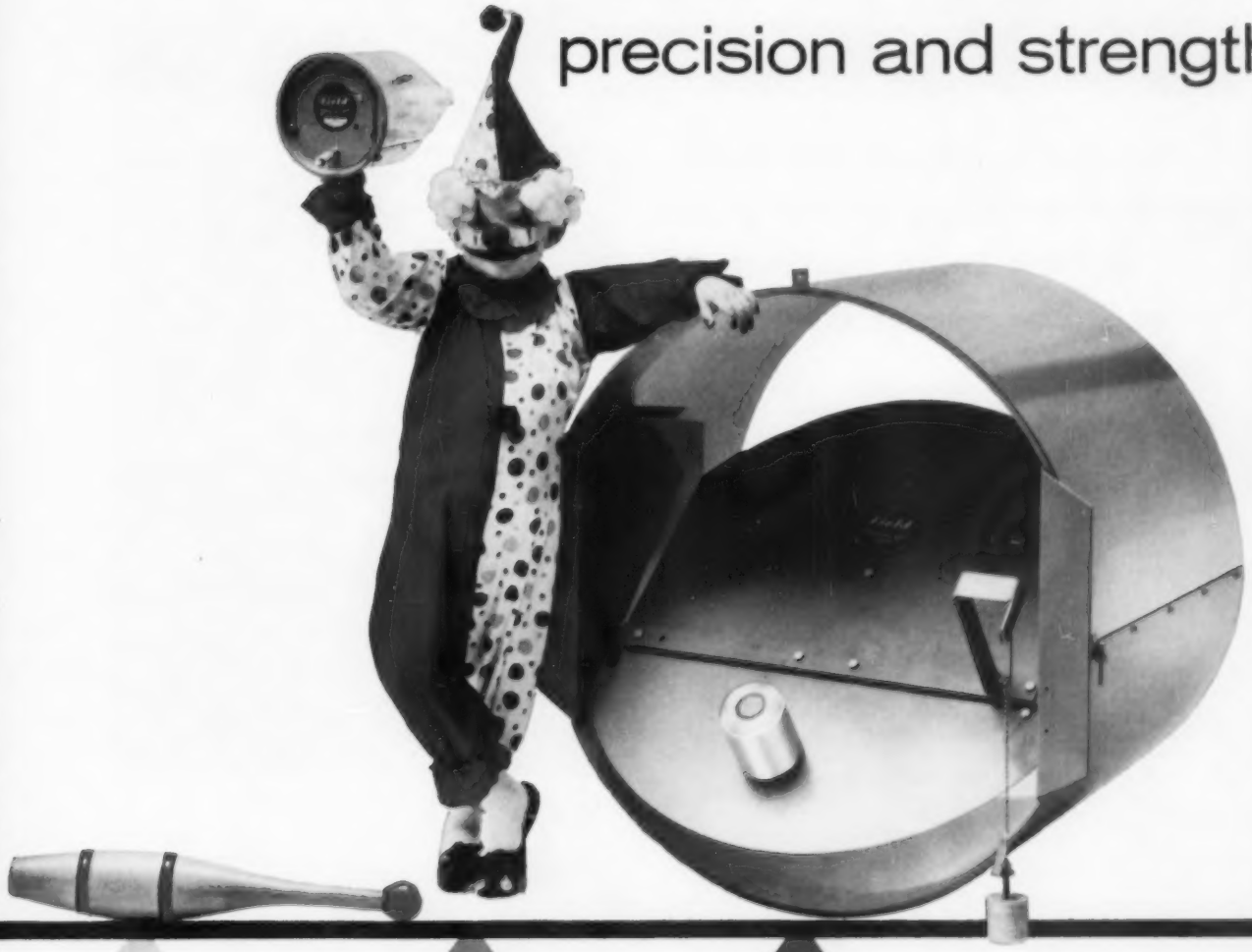
WRITE FOR
new four-page file-size brochure, with full details

The Stillwater Clay Products Co.
STILLWATER CONDUIT DIVISION
3334 C PROSPECT AVE., CLEVELAND 15, OHIO

STILLWATER CONDUIT SYSTEMS

midget or GIANT

Field draft controls provide both precision and strength



SIZES 6" THRU 32"
Field "M" Controls for oil and coal fired domestic, commercial and industrial heating plants

SIZES 8" THRU 32"
Field "MG" Double-Acting Controls for gas fired commercial and industrial heating plants

SIZES 6" THRU 9"
Field "RC" Controls for domestic oil and coal fired heating plants, for flue sizes 5" through 10"

FIELD CONTROL DIVISION
of H. D. Conkey & Company, Mendota, Ill.
AFFILIATES:
Conco Building Products, Inc. • Brick, Tile, Stone
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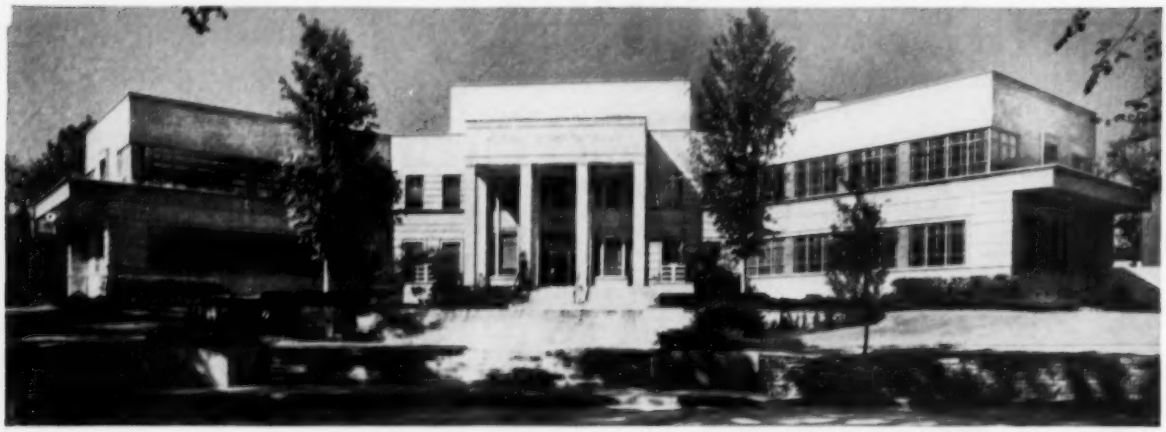
Field

WAGNER ELECTRIC MOTORS...THE CHOICE OF LEADERS IN INDUSTRY



New headquarters building of Rotary International at Evanston, Illinois

Wagner Motors provide quiet circulating pump power at new headquarters of Rotary International

Electric motors that drive heating system pumps need plenty of electrical and mechanical stamina to hold up under the hard, steady grind expected of them. And, they must be unusually quiet, too. Wagner Motors assure this kind of reliable service—and quiet operation.

That's why Bell & Gossett Company, manufacturers of Hydro-Flo Circulating Pumps, chose Wagner Motors for their Universal Pumps used in the new Rotary International Headquarters at Evanston, Illinois.

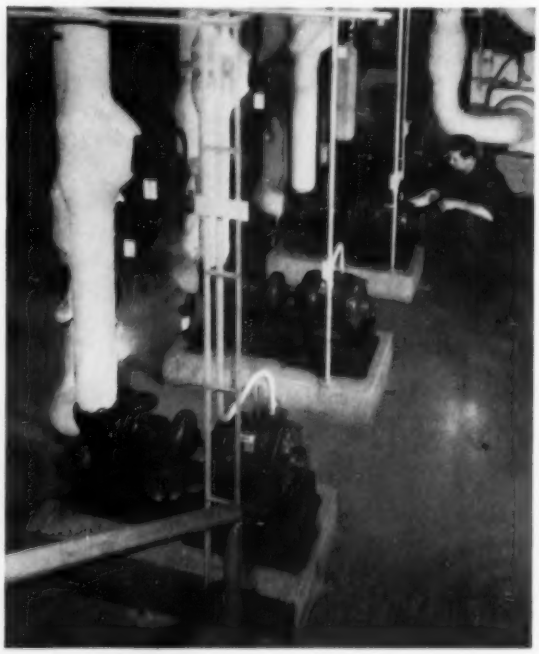
Part of this installation is shown at right. The motors in the foreground are 7½ horsepower, quiet-type Wagner Polyphase Motors, especially selected for smooth balance and quiet operation. The other motors in this installation are standard, resilient mounted 5 horsepower Wagner Polyphase Motors.

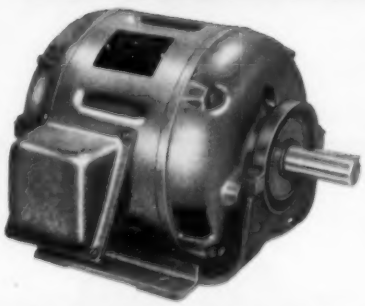
Here's where you can take a tip from Bell & Gossett . . . when you need dependable, *quiet* motors—5 horsepower or below—choose Wagner resilient mounted *standard* motors.

They are available with resilient bases in both sleeve and ball bearing types. You save money—and get the quiet operation that only a specially selected or resilient mounted motor can give.

Perhaps you have a specialized motor application . . . if so, remember, there's a Wagner motor to fit every need . . . a complete line for all current specifications with a wide variety of enclosure types and mountings.

Your nearby Wagner engineer can help you select the *right* motor to meet your specifications. Call the nearest of our 32 branch offices or write us.





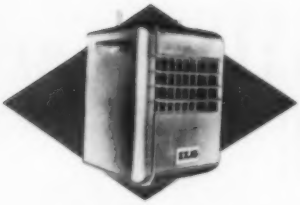
These Wagner standard motors, in ratings up through 5 horsepower, can be used for specialized applications because they are available in sleeve bearing or ball bearing models with rigid or resilient mounts.

Wagner Electric Corporation
6370 Plymouth Ave., St. Louis 14, Mo., U. S. A.

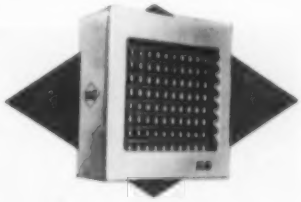
BRANCHES AND DISTRIBUTORS IN ALL PRINCIPAL CITIES

WM56-11

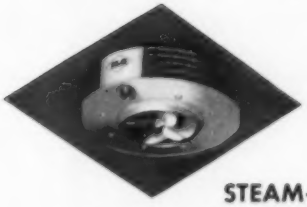
ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES • AUTOMOTIVE BRAKE SYSTEMS—AIR AND HYDRAULIC



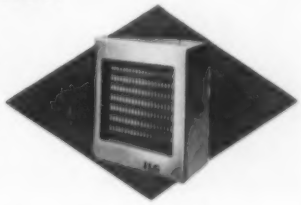
GAS — Ilg gas fired unit heaters for use with all types of gases; natural, manufactured, mixed, Propane or Butane. 7 capacities from 25,000 to 200,000 BTU's.



STEAM—Horizontal, available in 19 capacities from 21,000 to 286,000 BTU's.



STEAM—Vertical, available in 18 capacities from 34,200 to 596,000 BTU's.



STEAM—Textile Type, will not clog with lint, available in 10 capacities from 44,000 to 145,000 BTU's.

THE COMPLETE UNIT HEATER LINE

STEAM, GAS OR ALL ELECTRIC for ANY Plant, Store or Office

There's a unit heater in the big, complete ILG line that will meet your specific requirements . . . any type, any size, any style. Each is precision engineered and solidly constructed for quiet, dependable operation and easier installation. Warm, comfortable heating with greater efficiency, maximum safety is provided with a minimum of maintenance for a long operational life.

Whatever your need in heaters . . . steam or hot water, gas or electric, Ilg has the ideal model for the job. An Ilg Unit Heater will do the best job at the lowest cost . . . for the longest time!

ILG

ALL-ELECTRIC

New All-Electric Unit Heaters have black heat, non-glow type heating coil, are ideal for automatic heating. Heavy-duty capacities range from 1½ KW to 15 KW available for 115 and 230 volts, 5 KW sizes and up available for 440 and 550 volts.

ILG ELECTRIC VENTILATING CO.

2850 N. Pulaski Road, Chicago 41, Illinois

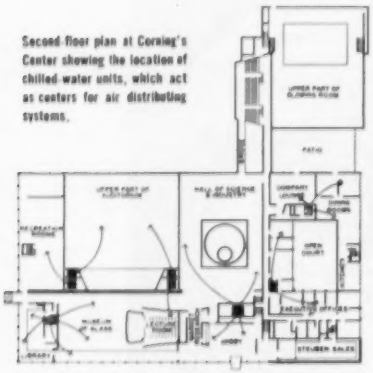
Offices in 56 principal cities

"FREON"* REFRIGERANTS IN AIR CONDITIONING

Field Reports about Successful Installations

Flow controls for central chilled water system satisfy extreme changes in load

Glass walls and constantly changing spectator loads created many problems when air conditioning was added to the Corning Glass Center in Corning, N.Y.



Second floor plan at Corning's Center showing the location of chilled water units, which act as centers for air distributing systems.

(shown above). A central chilled-water system with flow controls proved to be the answer. Cooling can be drawn to such heavily, but discontinuously, loaded areas as the auditorium from less occupied sections when needed.

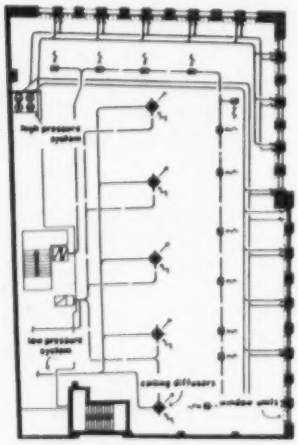
Corning's Glass Center was built to commemorate 100 years in the glass-making industry. Almost completely sheathed in glass and subject to intermittently heavy occupancy, the building presents a variety of ever-changing loads.

Three low-headroom, 86-ton refrigerating units installed in storage space beneath the library supply chilled water for nine remote locations. From these points fans, cooling coils, heating coils, and distribution units serve 28 widely diverse zones of comfort. Flow controls provided the extreme flexibility required and resulted in a considerable saving in tonnage from that calculated to satisfy maximum simultaneous cooling.

INDIVIDUAL TEMPERATURE CONTROLS FEATURED BY DOUBLE-DUCT SYSTEM

A high-pressure, double-duct air conditioning system (typical floor plan shown below) for the new Seamen's Bank for Savings at 30 Wall Street, New York, simultaneously carries hot and cold air throughout the building. Window units served by this high-pressure system mix room air with hot and cold air to meet the requirements of thermostats set in each unit and permit individual control of temperatures in any area. A standard low-pressure system delivers tempered air to the interior.

Heating and cooling systems, as well as the exhaust system, are served by



roof-mounted fans. An arrangement of dampers controls recirculation of filtered return air and use of filtered outside air.

Always ask for **"FREON"** *from your complete refrigeration wholesaler.*

You can specify a "FREON" refrigerant for any air conditioning or refrigeration application

For any air conditioning or refrigeration installation, you'll find no component of the cooling system is more important than the refrigerant used. That's why you should always specify a "Freon" refrigerant for the jobs you do.

You can be sure "Freon" refrigerants will not give you any trouble from acids or moisture. Du Pont's 25 years' experience manufacturing "Freon" is your assurance of unsurpassed quality and purity. Wholesalers everywhere can supply a "Freon" refrigerant for any size or type of air conditioning or refrigeration application.

Send for more information and technical data on uses of "Freon". Write to E. I. du Pont de Nemours & Co. (Inc.), "Kinetic" Chemicals Division 710, Wilmington 98, Delaware.

1931 KINETIC 1956

25 years of

FREON

SAFE REFRIGERANTS

"Freon" is Du Pont's registered trademark for its fluorinated hydrocarbon refrigerants.

DU PONT

BETTER THINGS FOR BETTER LIVING ...THROUGH CHEMISTRY

Clears the Air...

CONTINENTAL ***clears the air...***

with:

Self-Cleaning Automatic Filters

High Velocity Unit Filters, permanent viscous type—aluminum or steel dry-type—DYCON

Engine Air Intakes

Grease Filters

Low Velocity Unit Filters

*Ford Motor Company Foundry, Cleveland, Ohio

In filter installations, large and small, from coast to coast and beyond the seas, **CONTINENTAL** ***clears the air*** for industrial production and human comfort and health. Largest single Continental installation is of self-cleaning automatic filters rated at 3,048,000 CFM. Installed 5 years ago, this system has been delivering trouble free service ever since.* When greater capacity is needed, Continental can provide it.

In another important sense, **CONTINENTAL** ***clears the air.*** Avoiding extravagant claims and misleading inferences, Continental's advertising and sales representation adheres strictly to established fact from recognized authoritative sources and to the scientific findings of its own well equipped, competently staffed filter testing laboratory.

These testing facilities at Continental Air Filters are always available directly to you, to help solve any air filtration problems you may have. Call upon us anytime without obligation—or ask the Continental sales representative in your area to clear the air for you.

OUR CHALLENGE STANDS...

anything that can be made of steel sheets can be made of

Your very first sheet of Wheeling SOFTITE will prove to you that here is a galvanized sheet that is *different*. It's easier to work. No matter *how* you form it, Wheeling SOFTITE will not chip or crack! As a matter of fact, the zinc coating on this new ductile sheet is so *tight*-coated, you can use it to make anything that can be made of steel sheets.

As a result you can tight-crimp and lock-seam Wheeling SOFTITE without breaking the coating. It stays good-looking and rust-resistant far longer.

Make the test yourself. Put Wheeling SOFTITE through any operation and see if it isn't the most workable galvanized sheet you have ever used.

Get samples and full information today. Write Wheeling Steel Corporation, Wheeling, West Virginia.

WHEELING
SOFTITE®
GALVANIZED SHEETS

IT'S WHEELING STEEL

District Sales Offices: Atlanta, Boston, Buffalo, Chicago, Cincinnati, Cleveland, Detroit, Houston, New York, Philadelphia, St. Louis, San Francisco, Wheeling.

Real Heating Comfort for Low, Medium or High Buildings

For the Hangar that houses the big B-52 Bombers

(It's 90 feet high and one-sixth of a mile long)

Boeing again chose "Wing Revolving" Heaters

Since their first installation in the 1940's, the Boeing Airplane Company of Seattle has installed "Wing Revolving" Heaters in many of its hangars and other manufacturing buildings. When the new Flight Test Hangar, 880 feet long by 200 feet wide and 90 feet high, was built to hold five giant B-52 Bombers at one time, "Wing Revolving" Heaters once again were selected to heat it.

Mounted high above the planes, the heaters project warm air downward from slowly revolving distributing outlets. The entire working area is covered with a blanket of warm air that moves around, over and under the widespread airplane wings.

"Wing Revolving" Heaters can be the answer to your heating problem, too, regardless of the height or area of the building. With "revolving heat" every worker is in the "comfort zone" for there are no steady hot blasts; no pockets of cold air. And, in summer, with heaters operating with steam turned off, the revolving distributors produce a pleasant cooling effect that keeps workers refreshed and more productive.

To get details send for Bulletin HR-6A.

Four designs of revolving distributors are available. In the high hangar above, No. 10 design was used. At left is shown the No. 5 design for low buildings.

L. J. Wing Mfg. Co.

140 Vreeland Mills Rd., Linden, N. J.
Factories: Linden, N.J. and Montreal, Canada
In Europe: WANSON, Haren-Nord, Brussels, Belgium

Wing
REVOLVING HEATERS

WING FRESH AIR SUPPLY HEATERS

WING DRAFT INDUCERS

WING FANS

WING TURBINES

WING MOTORIZED BLOWERS

L. J. Wing Mfg. Co. HP-10
140 Vreeland Mills Rd., Linden, N.J.

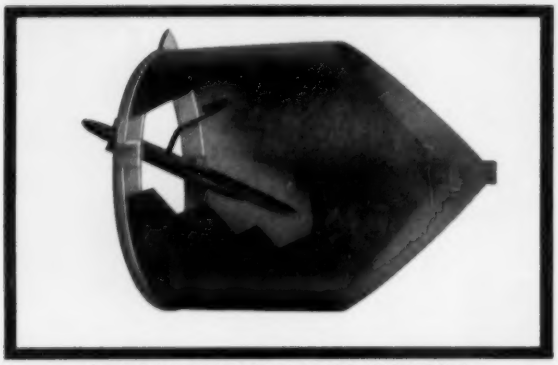
Please send me Bulletin HR-6A—Revolving Heaters

Name.....
Firm.....
Address.....
City..... Zone..... State.....

Best you can buy!

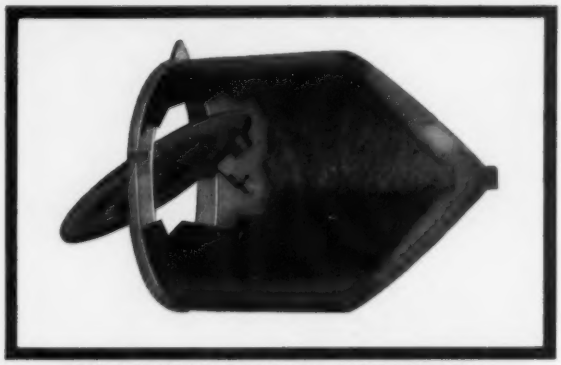
WALKER DOUBLE SWING CONTROL

to Regulate UPDRAFT, Dissipate DOWNDRAFT in gas-fired combustion equipment!



UPDRAFT VIEW OF WALKER BBG

This illustration shows how the Double Swing Vane opens INWARDLY for NORMAL UPDRAFT operation. The adjustment weight assembly, delicately designed for high sensitivity, operates by smooth pivot action, maintaining precise draft regulation under all stack draft variations. Automatic fluctuation of this vane keeps draft constantly uniform for top combustion efficiency.



DOWNDRAFT VIEW OF WALKER BBG

Vane here is shown swung OUTWARDLY for DOWNDRAFT relief. When downdraft occurs, the vane swings to the vertical or closed position. Weight of the adjustment assembly is automatically transferred to the relief bar and damper comes into perfect balance. Internal pressure in the breeching causes the vane to swing out, dissipating backdraft pressure before it can affect burner operation.

Unique New Walker Double Swing Control Delivers Two-way Performance for Better Efficiency, Greater Safety!

By preventing excessive draft and at the same time guarding against backdraft, the Walker Double Swing Control both increases efficiency and adds to the safe operation of gas-fired combustion equipment. Approved by Underwriters Laboratories, the Model BBG is another example of Walker's progressive design and superior engineering.

The unique relief bar arrangement that relieves the weight of the adjustment assembly under downdraft is responsible for the flawless performance of this outstanding control. Perfect balance is built in and adjusted at the factory for utmost sensitivity. Stainless steel knife-edge bearings, incorporated into the inner side of the sturdy frame, hold the vane rigidly centered to prevent scraping or sticking. All parts are stainless steel or cadmium-plated to resist corrosion—and a long, heavy gauge collar holds the draft control safely out of the flue gas stream for prolonged life of all parts.

OPTIONAL EQUIPMENT — SAFETY SWITCH AND RELAY

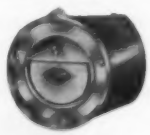
Prolonged downdraft can cause a dangerous concentration of combustion products in the boiler room. That's why Walker offers this optional safety equipment which flashes a red warning light when hazardous conditions occur. If downdraft continues to persist, relay cuts off the burner. This extra safety feature is well worth its modest additional cost.

Look to Walker
FOR A COMPLETE LINE OF DRAFT CONTROL PRODUCTS

Walker, with over 30 years of draft control experience, produces automatic regulators for a complete range of installations . . . from small space heaters to the largest heating plants in factories and multiple housing projects. For complete information on any of the complete line of Walker products, see your supplier or write directly to the factory.

Walker SHUR-FLO Draft Inducer-Regulator
New! Both inspirates and regulates. Corrects any difficulty caused by insufficient draft!

Walker BB
For all commercial and industrial applications.



Walker Royal Purple Model
The only automatic draft control that's absolutely impregnable to soot, carbon, corrosion, dust and dirt.

Get the Facts and You'll Get Walker! See Your Supplier or Write:

WALKER MANUFACTURING & SALES CORP.

1720 PENN ST. ST. JOSEPH, MO.

SIMPLIFYING HEAT EXCHANGER AND CONDENSER FABRICATION

The ease with which heat exchanger and condenser tubes can be rolled into tube sheets depends, to a certain extent, upon the uniformity of tube wall. One of the controlling factors of wall uniformity in the manufacture of seamless steel tubing is the contour of the piercer point.

Phil Morrison, a piercer point man, is shown at work on one of B&W's seamless tube mills. One of his duties is to examine the piercer point between each tube making operation. By making certain that the point has not been deformed in service—and that takes experience and a practiced eye—he helps to control wall uniformity in the pierced tube. He knows that although hot and cold work after the piercing operation can minimize, it cannot eliminate non-uniformity of wall section.

Phil's attention to detail, teamed with specially designed piercing equipment, helps to achieve the quality—"ease of rolling-in"—for B&W Heat Exchanger and Condenser Tubes. The Babcock & Wilcox Company, Tubular Products Division, Beaver Falls, Pa.

Seamless and welded tubular products, seamless welding fittings and flanges—in carbon, alloy and stainless steels

Get Engineered Safety...

ON YOUR NEXT PIPE SUSPENSION JOB!

"BUILT-IN SAFETY" ENGINEERING IS A STOCK ITEM IN THE FEE & MASON LINE!

Every F&M pipe hanger and support has been designed to answer a specific need in pipe suspension problems. This specialization in design provides you with more than adequate pipe support . . . at stock prices and deliveries. Specify and install Fee & Mason . . . the specialist's line of pipe suspension equipment!

FEE & MASON ENGINEERING ASSISTANCE ON SPECIAL APPLICATION PROBLEMS MAKES YOUR JOB EASIER . . . ON THE BOARD AND IN THE FIELD!

Fee & Mason's expert engineers and designers can give you the answer to special pipe supporting problems. A long pioneering background in working exclusively with pipe suspension problems qualifies F&M engineers to give you the "specialist's" help that makes your job easier. Contact your nearest F&M stocking wholesaler or sales representative!

Industry's Most Complete Line of Pipe Suspension Equipment

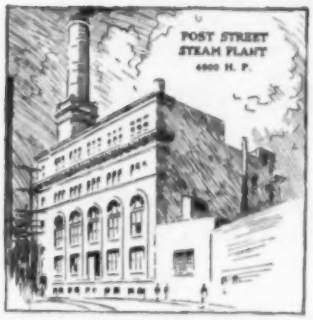
FEE & MASON

AMERICA'S LEADING SPECIALISTS IN PIPE HANGERS AND SUPPORTS

Since 1893

FEE & MASON MFG. CO., INC. • MANASQUAN, NEW JERSEY

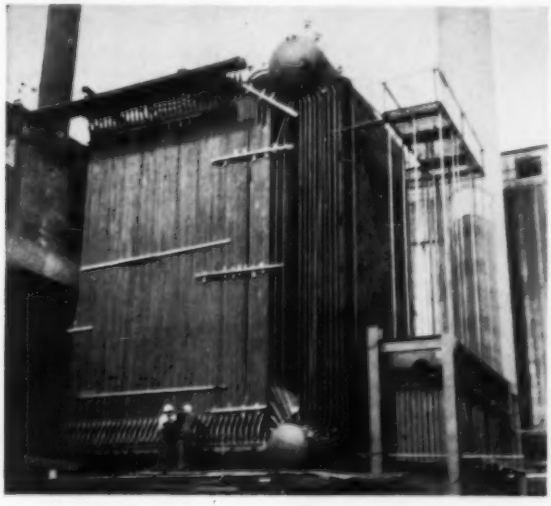
THERE'S A F&M STOCKING WHOLESALER IN YOUR TOWN!



GILSULATE®— The End of A Search

Old Post St. plant has 4,000 HP boiler capacity. Steam lines were originally encased in red cedarwood log conduits.

New Riley Boiler of Seattle Steam Corp. at their Western Ave. plant has 266,000 pounds per hour peak load; is set in weatherproof casing.

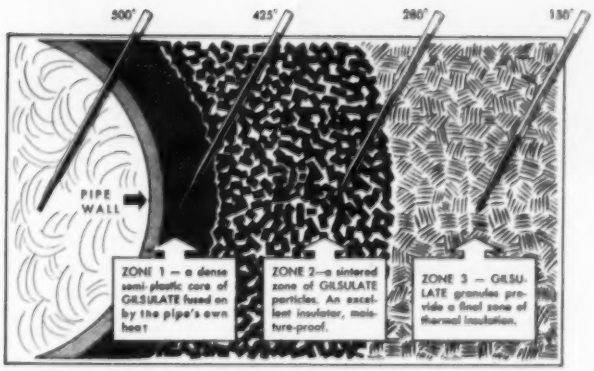


For more than half of a century, District Heating Companies have been seeking a way to prevent corrosion and reduce heat loss from underground steam mains. Many materials and techniques have been tried—unsuccessfully—spurred on by rising fuel prices and pipe replacement costs.

In 1952, Seattle Steam Corporation tried their first GILSULATE installation. So far, they have observed *complete corrosion protection and excellent insulating properties.* Is GILSULATE the end of the search?

Today this 18th largest of all American District Heating Companies orders GILSULATE in carload lots and maintains warehouse stocks for use on new lines, extensions and where a ditch is opened and existing facilities are exposed.

Investigate the values of this easily-installed, low-cost insulation yourself. Use the coupon below for complete information or write for the name of your nearest GILSULATE distributor.


500°
425°
280°
150°
PIPE WALL
ZONE 1 — a dense semi-plastic core of GILSULATE fused on by the pipe's own heat
ZONE 2—a sintered zone of GILSULATE particles. An excellent insulator, moisture-proof.
ZONE 3 — GILSULATE granules provide a final zone of thermal insulation.

Facts about Gilsulate

1. *Easy to use*—just pour, tamp and backfill...pipe heat does the rest.
2. *Forms 3 zones* of protection against heat loss and all hazards commonly encountered by hot buried pipes.
3. *Needs no housing or mechanical sheaths:* no mixing, special handling or equipment.
4. *Only needs normal pipe spacing:* for multiple pipe or cramped conditions.
5. *Three types available:*
   Type A for 220°-310° F. temp. range
   Type B for 300°-385° F. temp. range
   Type C for 385°-520° F. temp. range

THE TRIPLE-ZONE INSULATION FOR LIFETIME PROTECTION OF HOT UNDERGROUND PIPES

GILSULATE®

AMERICAN GILSONITE COMPANY, SALT LAKE CITY 1, UTAH
Affiliate of Barber Oil Corp. & Standard Oil Co. of California

American Gilsonite Co.
134-B West Broadway, Salt Lake City 1, Utah — or — 1145 East Jersey St., Elizabeth, N. J.

Send me more information on GILSULATE Insulation

NAME .....

TITLE .....

COMPANY .....

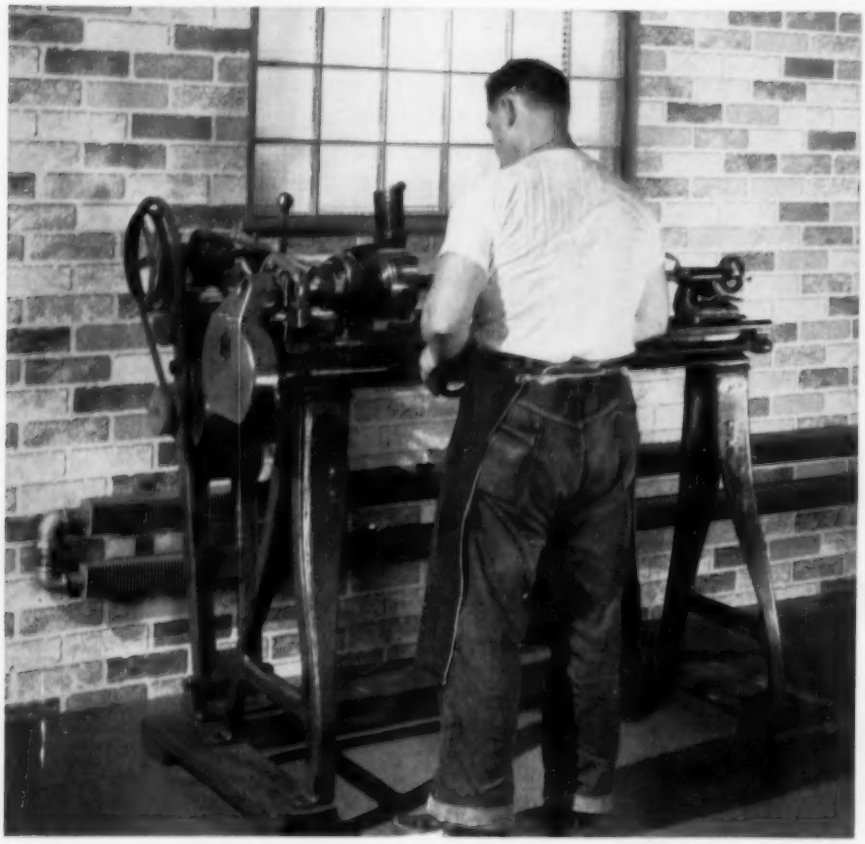
ADDRESS .....

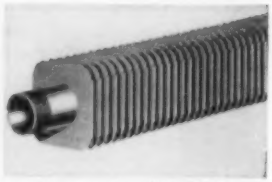
HPA

TEMTRIM Finned Tube Radiation

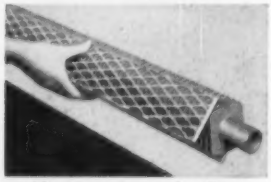
by AMERICAN-Standard

high output . . . low cost . . . easy installation



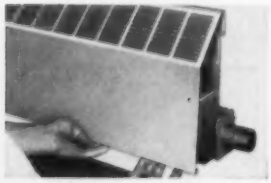


You can install Temtrim with fins exposed . . .



with a snap-on metal grille . . .

a flat top cover or . . .



a sloping top enclosure.

Hang them high or low, Temtrim Finned Tube Radiation Units project only 5″ into the room—don't steal valuable floor space. They're truly compact, yet they make up one of the most efficient types of radiation ever built.

Temtrim is low in cost and easy to install. It can be quickly connected and hung on the wall. Temtrim is fine for buildings old and new, where hot water or steam systems are used.

Fabricated from steel pressure tubing, Temtrim can be installed with fins exposed or with one of three attractive covers: snap-on metal grille, flat-top cover, sloping-top enclosure. Temtrim comes in two tube sizes to meet any heating requirements and convenient lengths of 2 to 12 feet, in one-foot increments.

For more information about Temtrim Finned Tube Radiation for industrial, public and commercial buildings, see your local American-Standard representative. Or, write AMERICAN-STANDARD, PLUMBING & HEATING DIVISION, 39 W. 39th St., New York 18, N. Y.

AMERICAN-Standard

PLUMBING AND HEATING DIVISION

THE MARK OF QUALITY

BARBER COLMAN

ELECTRIC-ELECTRONIC

Automatic Controls

Why electronic control?

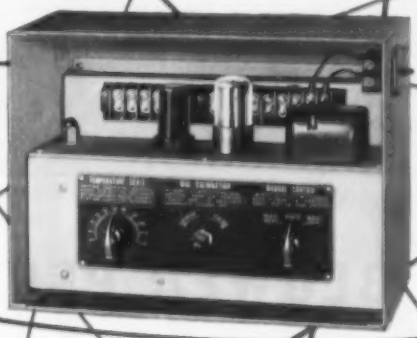
You get "*flexibility unlimited*" for stabilized temperature control

The only *simple* means of compensated control

Various types of compensating elements are available to anticipate load changes and stabilize discharge temperature. Keeps positive-acting electric controls from hunting or lagging.

Sensing elements located anywhere

Sensing elements are simple coils of temperature-sensitive wire. Dust-proof, tamperproof, foolproof, they are equally effective at any distance from electronic panel.



BARBER-COLMAN *ELECTRONIC* CONTROL PANEL

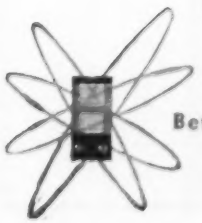
Temperature adjusted remotely

Convenient "Control Center" in equipment room or other central location gives building engineers easy, exclusive control of temperature and thermostat sensitivity settings.

Fewer limitations on automatic sequencing

Electronics makes possible a wider variety of equipment sequencing, providing an unlimited range for the system designer.

No other controls offer such fast, positive response. All settings are made on legibly marked dials. "Control Center" installation streamlines operation . . . eliminates tampering. Components are easily replaceable, and there is practically no maintenance. Learn the details of this truly modern approach to temperature control which Barber-Colman pioneered. Phone our nearby Field Office or write today!



Better control . . . *electronically*

Barber-Colman Company

DEPT. J, 1301 ROCK STREET, ROCKFORD, ILLINOIS, U. S. A.

Peerless Development Engineer Richard Thompson (at control board) guides unit through development and George Goldner conducts final inspection.

VERIFIED BLOWER PERFORMANCE

● It just makes good sense to specify Peerless. Every fan or blower leaving our plant is unconditionally guaranteed to meet all established industry test codes (NAFM or PFMA). To an engineer, guaranteed performance means specifying without doubt—to a contractor it means good performance and no callbacks.

OUTSTANDING PERFORMANCE. The outstanding service records of Peerless fans and blowers stem from excellent design and thorough tests in every step of development and manufacture. A minimum of eight, 20-point determinations are made during the development period alone.

100% INSPECTION. Every unit (including the job-matched Peerless custom-built motor) receives 100% inspection before it leaves our plant. Wheel alignment and lubrication are checked . . . variable pitch pulleys are adjusted to correct motor RPM for exact CFM . . . angle of discharge is set . . . each unit is ready to go when you receive it.

COMPLETE LINE. There is a Peerless fan or blower for virtually every application. Complete data is catalogued for easy reference. Peerless Bulletin SDA-160 shows fans and forward curve blowers. Bulletin SDA-200 gives complete data on backward curve blowers (NAFM) from 12½" to 36½". These two bulletins will help you solve most air-moving problems. To get your copy, use the coupon below. Dimension prints are available on request.

FAN AND BLOWER DIVISION

Peerless Electric

THE PEERLESS ELECTRIC COMPANY

1409 W. MARKET ST. • WARREN, OHIO

FANS · BLOWERS · MOTORS · ELECTRONIC EQUIPMENT

THE PEERLESS ELECTRIC CO.

WARREN, OHIO

☐ Send me Bulletin SDA-160.

☐ Send me Bulletin SDA-200.

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HALF A MILLION

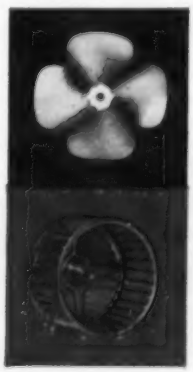
'VARIATIONS ON A THEME'

Industry writes the score—to the tune of nearly four billion dollars worth of products a year using Torrington air-impellers.

The research and development necessary to meet this tremendous demand is responsible for upward of half a million design variations of Torrington products... nice music when you have a tough problem.

If you are a design or production engineer, our exclusive engineering laboratory facilities—and our product engineering experience—are directly available to you for the solution of air moving problems related to your products.

Simply write or call us, or your nearest Torrington representative.

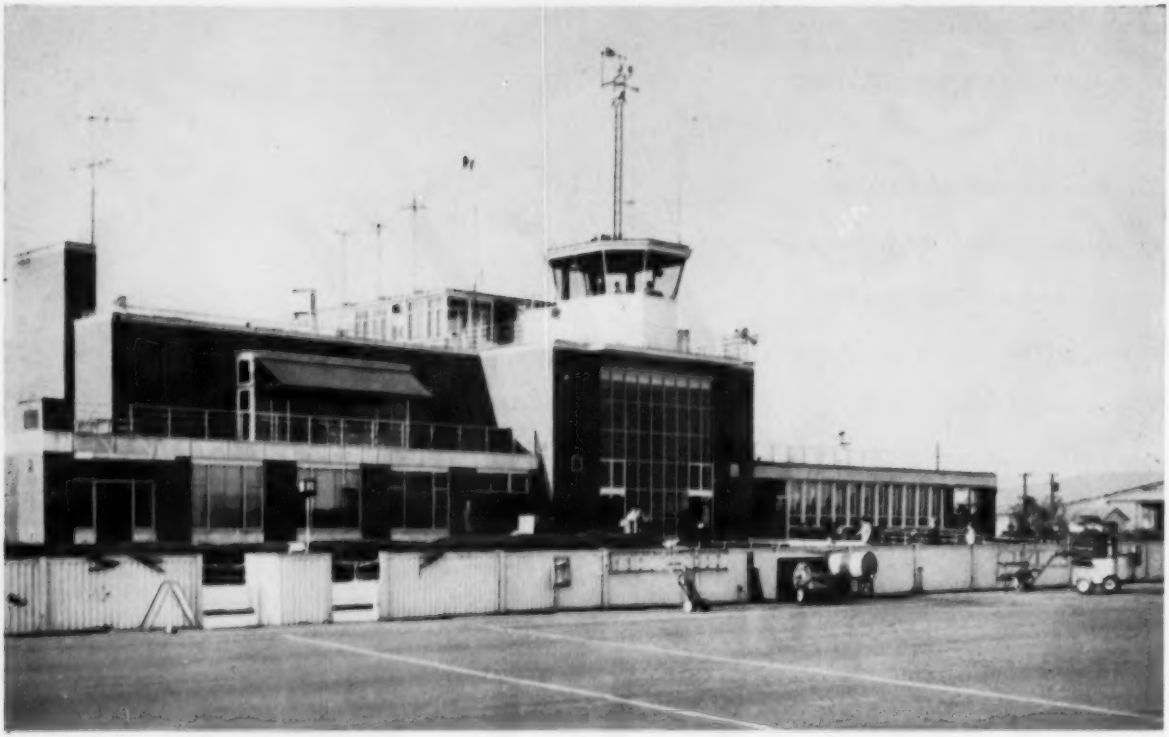


THE
TORRINGTON
MANUFACTURING COMPANY
TORRINGTON, CONNECTICUT
VAN NUYS, CALIFORNIA · OAKVILLE, ONTARIO

WILL-BURT STOKERS

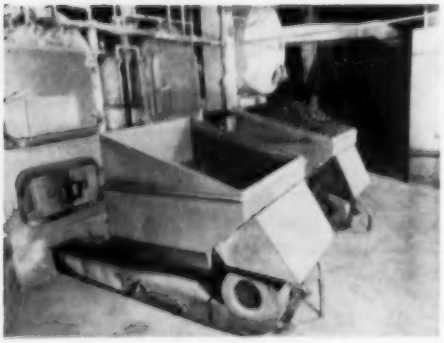
AT SMITH REYNOLDS AIRPORT

WINSTON-SALEM, NORTH CAROLINA



". . . silent, untiring partners for 15 years"

SAYS ROBERT K. JOERGER,
AIRPORT MANAGER



Will-Burt Stokers, installed 1940.

ARCHITECT: Hall Crews, Winston-Salem, North Carolina
CONTRACTOR: Sam E. Beck, Inc., Winston-Salem, North Carolina
DISTRIBUTOR: Atlas Supply Co., Winston-Salem, North Carolina

It's a great satisfaction to have such comments from a Will-Burt owner – particularly when we consider the difficult heating problem presented here. Doors opening constantly, a completely exposed building, lots of glassed-in area – yet Mr. Joerger says, "Will-Burt Stokers have been silent, untiring, economical partners in our successful effort to keep our passengers and tenants comfortable in the severest weather".

We don't cite this as an unusual case. Our purpose is to call your attention to the kind of service we know Will-Burt Stokers will give.

Find out about Will-Burt Stokers, Automatic Air Control, and Panel Board stoker "automation". Write for our brochure, "The Logic of Stoker Heating". A stoker-heating manual, with installation diagrams and suggested specifications is also available.

The WILL-BURT Company

OUR TWENTY-SEVENTH YEAR IN THE STOKER BUSINESS

P.O. BOX 902, ORRVILLE, OHIO

Burning coal the modern way cuts operating, labor costs for Inland Container

Expansion at the Indianapolis plant of the Inland Container Corporation required additional steam capacity. The expansion was complicated by the limited space available. Inland's Engineering Department, with the assistance of W. J. Barrows & Associates, Engineering Consultants, solved the expansion problem.

Today the power plant has a new 30,000 lb.-per-hr. boiler and also a 300-ton silo. Liberal use has been made of automatic controls; coal and ash handling have been completely mechanized. Now steam loads are adequately maintained. Boiler room performance has been highly satisfactory and economical. Furthermore, this modernization has enabled Inland Container to effect considerable savings by more efficient operation of its power system.

For further information or additional case histories showing how other plants have saved money burning coal, write to the address below.

NATIONAL COAL ASSOCIATION
Southern Building • Washington 5, D. C.

Consult an engineering firm

Designing and building hundreds of heating and power installations a year, qualified engineering firms can bring you the latest knowledge of fuel costs and equipment. If you are planning the construction of new heating or power facilities—or the remodeling of an existing installation—one of these concerns will work closely with your own engineering department to effect substantial savings not only in efficiency but in fuel economy over the years.

facts you should know about coal

In most industrial areas, bituminous coal is the lowest-cost fuel available • Up-to-date coal burning equipment can give you 10% to 40% more steam per dollar • Automatic coal and ash handling systems can cut your labor cost to a minimum. Coal is the safest fuel to store and use • No smoke or dust problems when coal is burned with modern equipment • Between America's vast coal reserves and mechanized coal production methods, you can count on coal being plentiful and its price remaining stable.

the TOUGH STEEL FRAMES and FEET

PLUS values in power

of HOWELL series one hundred motors give you

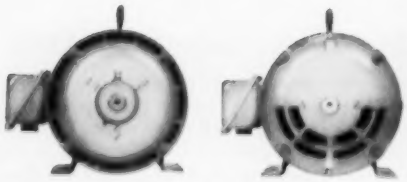
A MORE RUGGED MOTOR CONSTRUCTION, GREATER "INSTALLATION FACILITY"

The die-formed, cold-rolled steel frame of a Howell Series 100 motor takes the impact of a dropped hammer or other accidental blow with hardly a dent . . . and never a crack to show. Or take the more common installation accidents . . . too much tightening on the mounting bolts or the shock of the motor dropped too hard. Howell's steel mounting feet have the resiliency to take punishment that would crack the ordinary cast iron mountings.

In the end-plates, where rigidity is essential for constant bearing and shaft alignment, Howell uses cast iron.

It all adds up to "installation facility" . . . meaning freedom from trouble when these motors are being put to use on machines. Consider the delays and expense you can save by reducing motor damage and you'll specify the modern steel frame construction of Howell Series 100 motors every time.

GET THE PLUS values THAT COUNT....specify HOWELL series 100 motors



TEFC—open interchangeability

The totally enclosed fan-cooled and open drip-proof or weather-protected types of Howell Series 100 motors have all major dimensions alike, except length. Emergency interchanges are easy.

heat-source ventilation

Wide slots in the stator provide 50% more contact between cooling air and stator laminations, main source of motor heat. Cool running Series 100 motors last longer.

smaller, lighter, better looking

Save machine and storage space, save shipping weight, and get new functional streamlining that matches the motor to your most modern machine design or production equipment. Why put up with dust catching fins on a motor, when sleek good appearance costs no more.

For more details on Series 100 motors, write for Bulletin N-100-R

PRECISION-BUILT MOTORS FOR INDUSTRY SINCE 1915

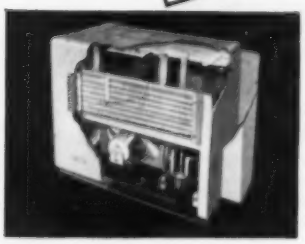
HOWELL Red Band MOTORS

HOWELL MOTORS

HOWELL ELECTRIC MOTORS COMPANY, HOWELL, MICHIGAN

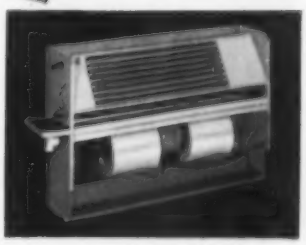
Now—your choice

for year-round air conditioning of commercial and institutional buildings—from **MUELLER CLIMATROL**



For
self-contained cooling . . . central steam or water heating

For
central cooling and hot water heating systems



Recessed Air Conditioner. Individual room control saves fuel and power costs — unit works only when needed. You can offer heating *and* cooling for about half the cost of a complete central system. Can be installed room-at-a-time on budgeted program, without disturbing tenants. Efficient one-hp refrigeration cycle uses no water.

Fan Coil Units. Both recessed and cabinet types, in the most complete range of floor-mounted sizes — 200, 300, 400 and 600 cfm. Twin blowers draw room air through permanent filter (standard), blend it with fresh outside air if desired, force it over coil that circulates hot or chilled water. Four-row coil gives better dehumidification.

With this pair of outstanding units, you've an inside track in your bids for multi-room heating and cooling installations. *For new buildings,* both design and performance stand out as the ultimate in modern comfort concepts.

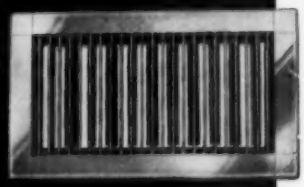
As replacements, their economy and ease of installation add convincing weight to the magic appeal of all-year air conditioning. For closer study of facts, specifications and installation data write for literature.

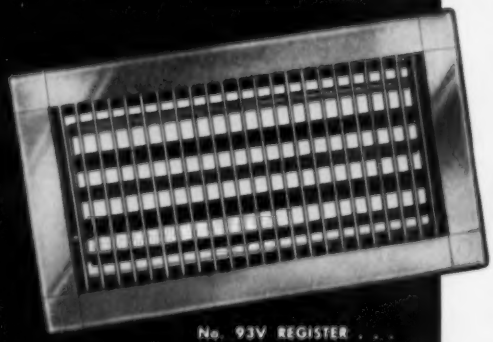
Mueller Climatrol
Department 106
2023 W. OKLAHOMA AVE. • MILWAUKEE 15, WIS.

Because

No. 92VHV — MULTI-DEFLECTION REGISTER Vertical face bars, horizontal secondary bars, vertical louvers. Also available without valve, No. 92VHO.

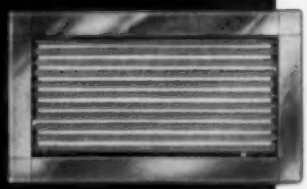
No. 92VOV — SINGLE DEFLECTION REGISTER with vertical face bars and louvers. Also available without valve, No. 92VOO.





No. 93V REGISTER . . . vertical front bars set straight, horizontal louvers.

No. 94A GRILLE . . . horizontal face bars set at 22° angle for up or down deflection.



HART & COOLEY

THEY PROVIDE Perfect Air Control

H&C TRIPL-AIRE . . . REGISTERS & GRILLES for COMMERCIAL INSTALLATIONS

. . . are already downright favorites with a large and rapidly growing number of architects, air conditioning engineers and installers. For with this line it's never necessary to compromise. It permits you to readily achieve the exact air distribution, direction and volume best suited to each and every situation. There are 26 standard sizes, up to 36" x 12", offering 260 possible horizontal and vertical deflection combinations. Intermediate sizes up to 36" x 36" may be had on order. Front adjustments control face bars and louvers, and opposed louvers permit absolute volume control with equal distribution over entire face. Top quality "Decorator Gray" enamel finish. Your nearby H&C Jobber has complete details. We will be glad to furnish his name and location on request.

H&C FIXT-AIRE . . .

. . . return air registers and grilles designed to complement and harmonize with the TRIPL-AIRE line. Registers have a single bank of face bars in fixed vertical or horizontal position, and feature the same opposed louver construction for positive volume control found in TRIPL-AIRE units. Grilles are available with horizontal face bars set at 22° angle for up or down deflection where desired. One-piece sizes up to 36" x 30".

CONVENIENT CATALOG GIVES COMPLETE DETAILS AND ENGINEERING DATA . . . Available from H&C Jobbers or write direct.

MEMBER INDOOR COMFORT

MANUFACTURING COMPANY

Dept. 2-AC HOLLAND, MICHIGAN

most dramatic decorating idea in years

THE *Fashion* THERMOSTAT

by WHITE-RODGERS

accents room beauty . . .
or matches any color scheme

handsome finish
harmonizes with
any room . . .

or it can be painted . . .

. . . the same color as the wall

Hinged cover conceals the thermostat . . . beautifully styled case becomes part of the wall. Precision engineered throughout by White-Rodgers, the quality name in thermostat design and manufacture. The *Fashion* Thermostat will capture the imagination of your customers...they'll be talking about it...asking you for it. Be ready for them...and for new sales and profits that are headed your way!

for full details write us...or contact your regular supplier of heating and cooling equipment.

Controls for modern comfort

WHITE-RODGERS

ST. LOUIS 6, MISSOURI TORONTO 8, CANADA

WR

Exclusive new CARRIER refrigerating machine cools with steam

From Carrier—first name in air conditioning—now comes a new absorption refrigerating machine designed for big building air conditioning or for process cooling in industry.

Cools with steam—and CUTS COSTS! Low-cost steam is the energy source. Electricity is needed only for small pumps and controls.

Cools with steam—and OPERATES AUTOMATICALLY! You push a single button and electronic controls take over. Push the button again and the system shuts down. As simple as that!

Cools with steam—and SAVES SPACE! The Carrier Absorption Machine is so light you can locate it on the roof or wherever you have space to spare.

Cools with steam—and FOLLOWS FLUCTUATING LOAD! Meets minute-to-minute needs from full load to zero capacity. And it can't be damaged by overloads.

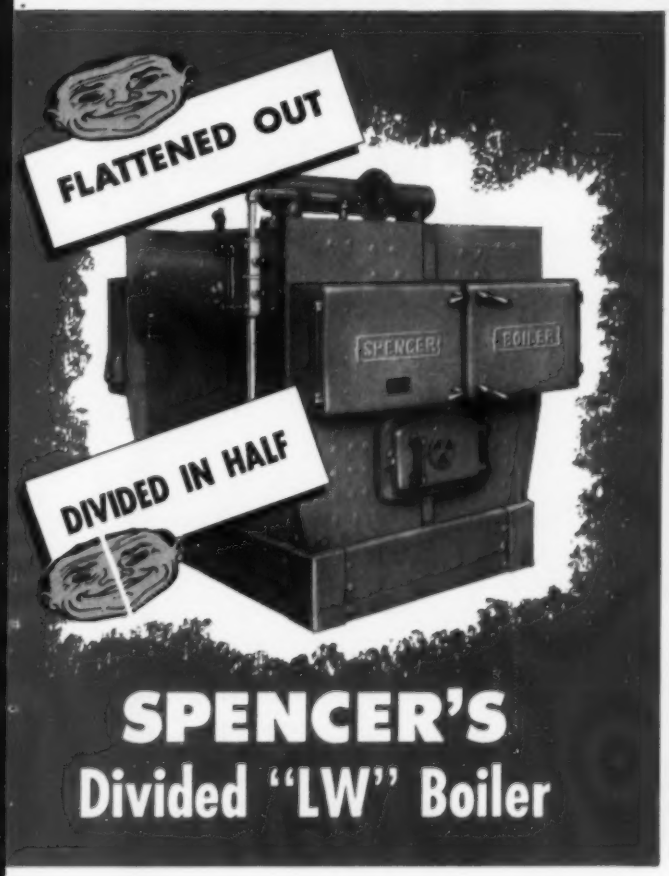
Cools with steam—and GIVES YOU CARRIER DEPENDABILITY! Designed to give reliable, trouble-free service. Around the clock. Around the seasons.

For your copy of the colorful new booklet about Carrier Absorption Refrigeration, call the nearest Carrier office. Or write Carrier Corporation, Syracuse, New York.

Carrier

air conditioning
refrigeration
industrial heating

SOLVE major heating problems with advanced SPENCER designs!



SPENCER'S Divided "LW" Boiler

Unique Low-Waterline "LW" solves installation problems

Divided in half . . . can be moved, one watertight section at a time, through narrow openings.

25% lower than conventional boilers of same capacity. Solves low headroom problems in existing buildings . . . excavation problems in new buildings. Traditional Spencer efficiency can be adapted to any fuel . . . mechanical or hand firing.

SIZES:
ranging from 3,500 to 42,500 sq. ft. steam

SPENCER'S "A" Boiler

Durable Spencer "A" cuts installation time . . . provides economical heat

Unique flue-and-smoking units save hours in installation time; compact design saves valuable floor space—takes less headroom. Special peaked firebox and staggered boiler tubes provide faster heating . . . more efficient heat transfer; available for stoker or hand firing . . . can be adapted to any fuel.

SIZES:
ranging from 3,500 to 42,500 sq. ft. steam

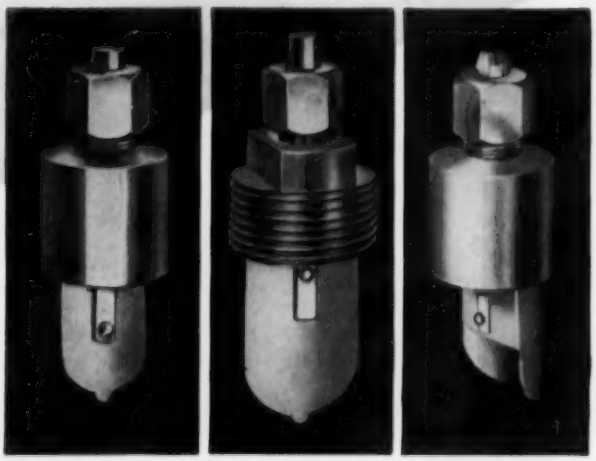
SPENCER HEATER
LYCOMING DIVISION
WILLIAMSPORT PENNSYLVANIA

H SBI

Quickly installed!

MAID-O'-MIST
BALANCING VALVE
ADAPTER UNITS

Perfect for all hot-water heating or chilled-water cooling systems



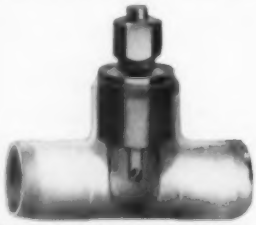
No. 14
Install in copper or bronze tee to complete a balancing valve

No. 15
Install in cast iron tee to complete a balancing valve

No. 16
Install in cast brass tee to complete an angle balancing valve

With MAID-O'-MIST balancing valve adapter units, you can avoid carrying heavy stocks of balancing fittings. That's because the MAID-O'-MIST units can be installed without advance planning. They're simple as A-B-C to install, and they cost a mere trifle. They are sweat-fitted into copper, bronze or brass tees, and threaded into cast iron tees.

And what a remarkable job they do in letting water flow freely thru the tee! Since the pipe diameter isn't reduced, there's no water restriction except for the balancing required. Contractors and Engineers agree: MAID-O'-MIST Adapter Units, teamed with MAID-O'-MIST'S famed Auto-Vents make a hard to beat team for efficient water circulation.



NO. 14 . . . Phantom view of one-inch Adapter Unit in a tee ready for balancing.

Get full information from your jobber or write for catalogue today!

MAID-O-MIST Inc.

MAID-O'-MIST, Inc.
3217 NORTH PULASKI ROAD · CHICAGO 41, ILL.

. . . . . in DU PONT a CAREER POSITION for an AIR CONDITIONING ENGINEER

The Engineering Service Division of du Pont's Engineering Department now has immediately available a challenging long-range position for a graduate engineer with 5 or more years experience in the selection and operation of heating, air conditioning, ventilating and refrigeration equipment. The successful applicant will provide consultation to operating plants and to design and construction groups on the evaluation and economic operation of such equipment.

Duties will require a broad and detailed knowledge of heating methods and systems, fans, building heat transmission, automatic controls, air cleaning devices, spray apparatus, sorbent materials, refrigeration, air duct design, exhaust and conveying systems, drying systems, health aspects of ventilation, piping and insulation, instruments and measurements, and investment and operating costs.

NEW YORK INTERVIEWS
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November 25-26-27-28
To arrange an appointment with our technical representative, please call
Mr. K. S. Marlin, Jr.
PEnnsylvania 6-5096

BOSTON INTERVIEWS
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To arrange an appointment with our technical representative, please call
Mr. K. S. Marlin, Jr.
HAncock 6-2044

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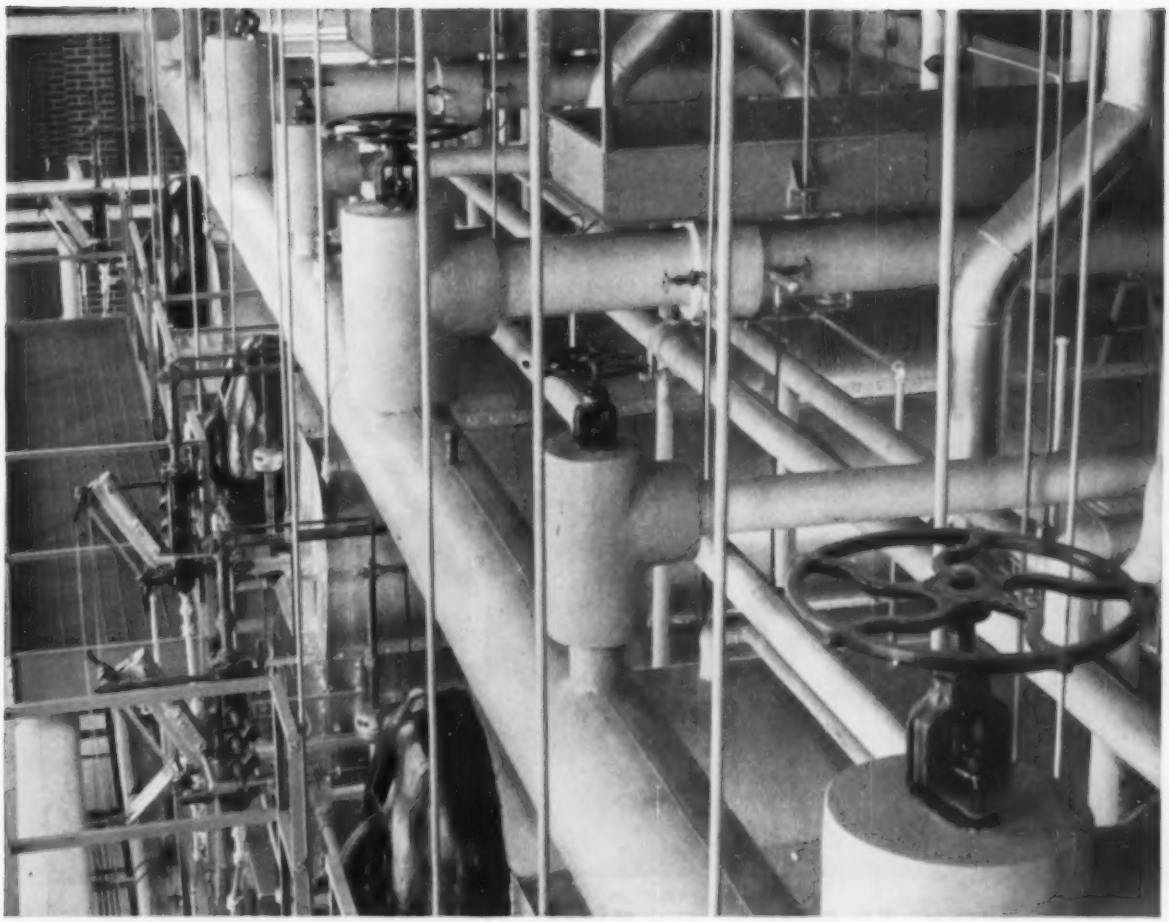
Or you may send complete resume, including details of education and experience, to:
Mr. K. S. Marlin, Jr.,
Engineering Department

E. I. du Pont de Nemours & Co., Inc.
Wilmington 98, Delaware



THE PERFECT HEAT-SAVER for temperatures up to 600°F. is K&M "Featherweight" ® 85% Magnesia. Note the well-insulated headers, valves and piping in this college building boiler room.

Permanent Insulation Efficiency with K&M "Featherweight" 85% Magnesia

Good for the life of the equipment it insulates . . . that's K&M "Featherweight" 85% Magnesia. There's no gradual loss of insulating effectiveness to push heat-piping costs up . . . regardless of time in use.

This is a great K&M product, proved superior in countless applications. "Featherweight" 85% Magnesia withstands moisture, vibration, frequent temperature changes. It is always easy to handle and install. It is the most practical, efficient insulation ever made for temperatures up to 600° F.

THERE IS A COMPLETE LINE OF K&M INSULATIONS. For temperatures that range up to 1900° F., there are K&M insulations that efficiently keep heat where it is wanted. Each is widely used throughout industry.

For more information on heat-saving, money-saving K&M insulations, contact your K&M distributor who is an experienced applicator. Or write directly to us.

K&M LOW-PRESSURE INSULATIONS

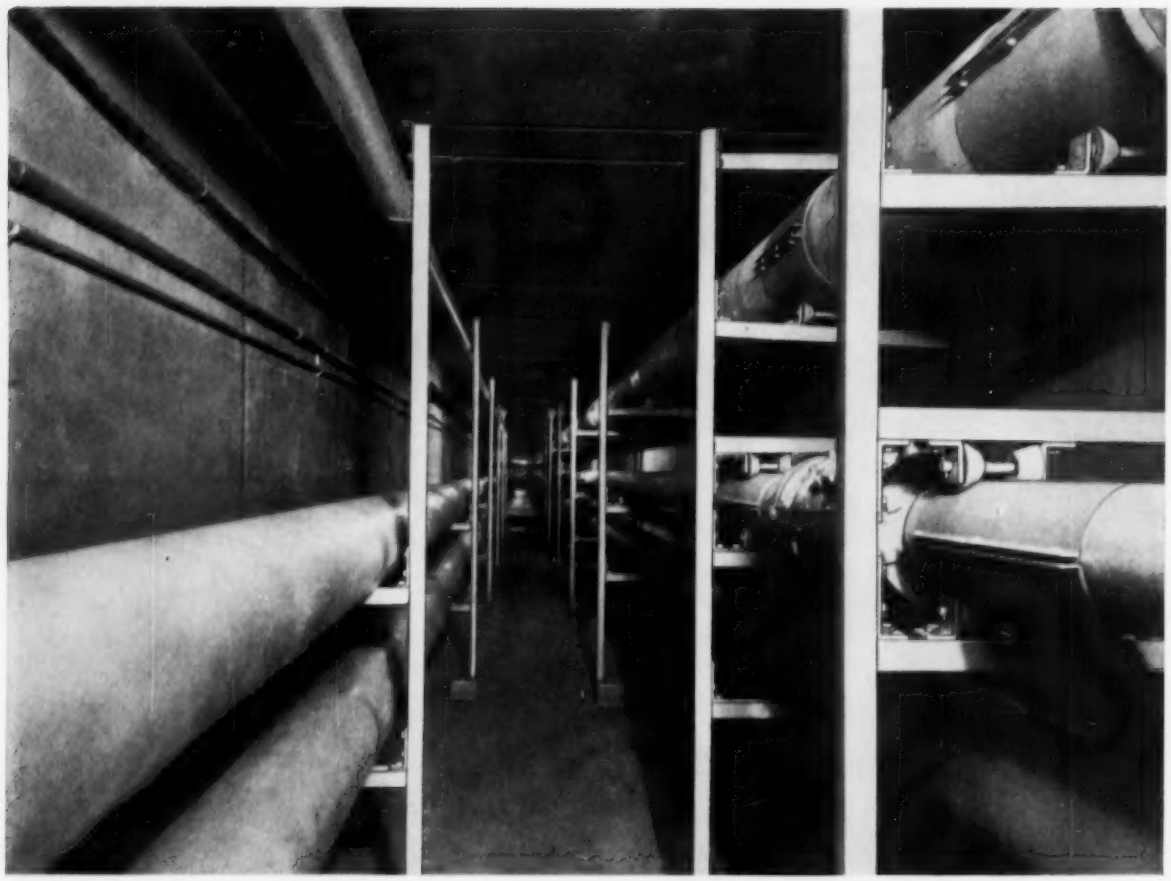
K&M Air Cell Pipe, Sheet and Block Insulation
K&M Fine Corrugated Air Cell Pipe, Sheet and Block Insulation
K&M Special Fine Corrugated Air Cell Pipe, Sheet and Block Insulation
K&M Simplex "Super Shrunk" Pipe Insulation
K&M Bestfelt Lamino Sponge Pipe and Block Insulation
K&M Duplex Pipe Insulation
K&M Nu-Wrap Non-Sweat Sectional Pipe Insulation
K&M Amblerex No. 2 Insulating Cement
K&M No. 152 Asbestos Finishing Cement

K&M HIGH-PRESSURE INSULATIONS

K&M "Featherweight" 85% Magnesia Pipe and Block Insulation
K&M Hy-Temp Pipe and Block Insulation
K&M "Featherweight" 85% Magnesia Cement
K&M Hy-Temp Cement
K&M KaytherM Block Insulation

KEASBEY & MATTISON
COMPANY • AMBLER • PENNSYLVANIA

K&M Cut in asbestos ®



For faster, easier pipe-racking, use versatile UNISTRUT® channel

Look how quick, easy and economical it is to install racking with UNISTRUT steel framing:

(1) Cut UNISTRUT channel to length;
(2) slide in the UNISTRUT nut;
(3) tighten with a wrench. That's all!

Better still, you get everything you need in the complete UNISTRUT line—channel, clamps, hangers, concrete inserts, rollers, or any other accessories your installations require.

Think how this advanced method can cut your costs! No drilling, welding or riveting. No fussing to get exact slope or pitch—UNISTRUT framing is completely adjustable. And it's easy to alter or add to the installation any time—the UNISTRUT system is extremely flexible.

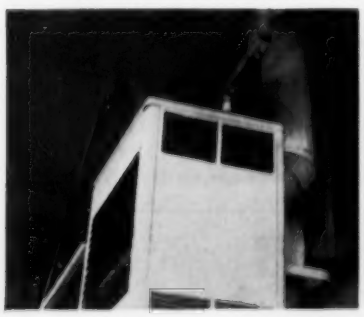
Here is the foolproof, economical method for superior support of steam, gas, heavy water, light conduit or air-conditioning lines. Find out about UNISTRUT framing now!

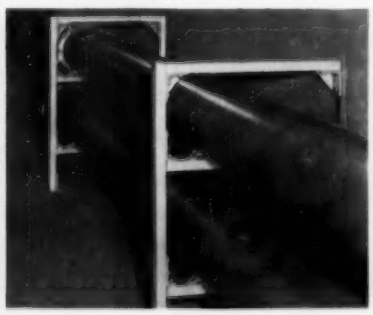
Write Dept. H-10 for 78-page Catalog No. 700, giving complete information.

UNISTRUT framing supporting unit heater—a tricky job made easy through horizontal and vertical adjustability of UNISTRUT.

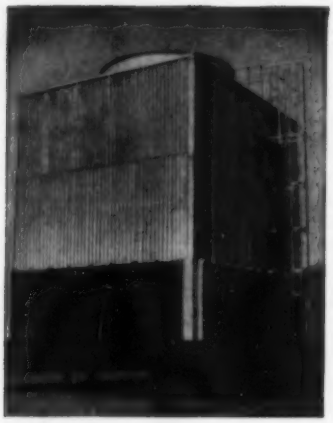
UNISTRUT framing—with UNISTRUT concrete inserts—supporting heavy water and sludge lines.

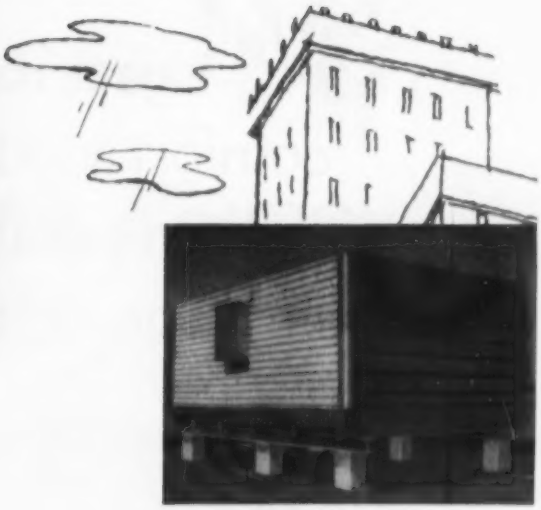
UNISTRUT PRODUCTS COMPANY
933 W. Washington Blvd., Chicago 7, Illinois





U. S. Patent Numbers 2327587 2329815 2380379 2363382 2345650 2541908 2405631 2696135 Other Patents Pending





the Park Avenue approach to WATER COOLING

Landlords of America's most expensive rental properties are among the most analytical buyers in the country. They are expected to provide the very best in building equipment and services; they are required to observe some of the most stringent building codes. This explains why Marley steel cooling towers far outnumber those of any other make on Park Avenue.

Actually, Park Avenue's approach to water cooling towers is no different from that of the merchants on Main Street, U.S.A. Throughout the country, Marley cooling towers are first choice—for economy . . performance . . . appearance . . durability. They conform to the most stringent building and fire codes. They're designed for easy and economical installation. And Marley packaged cooling towers are readily available locally, in a complete range of sizes.

Large, medium, or small — Marley has them all in its lines of Aquatowers, Double-Flow Aquatowers and CS (Counterflow Steel) series. All three are also available in wood models to give you a selection for every conceivable cooling situation. Complete information on the complete Marley line is as near as your local Marley Application Engineer.

The Marley Company

Kansas City, Missouri

MARLEY

ARCHITECT: VICTOR GRUEN ASSOCIATES, LOS ANGELES, CALIF. AIR CONDITIONING CONTRACTOR: YORK CORP., CHICAGO, ILL.

McQuay Units at Dayton's Southdale to re-use cooling water for heating

A unique heating and air conditioning system will keep Southdale, Minneapolis' newest and largest regional shopping center, a comfortable 70° inside the year 'round. This installation marks the sixth time McQuay equipment has been used by Dayton's, one of the country's outstanding department stores. Thirty-one compact McQuay "HC" units suspended in the ceiling along outside walls will compensate for perimeter heat loss near glass areas and at roof level.

Twenty-one ceiling mounted McQuay "AC" Seasonmaster units in the center of the main store will provide cooled air to offset heat from large crowds of shoppers, lighting and interior equipment. By automatic control of the two systems, a constant, uniform temperature of 70° is maintained regardless of whether outside temperature is a frigid −25° or a torrid 100°.

Well water of 48° to 50°, brought up from 600 feet below the ground, is circulated through the condenser. Then at a temperature of 70° to 90°, it is pumped underground to another natural reservoir. This water retains a percentage of its heat and is used again the following winter for heating. After being used for heating, the water is returned to the cold water source. It is anticipated that the heating cycle will become more and more efficient each year.

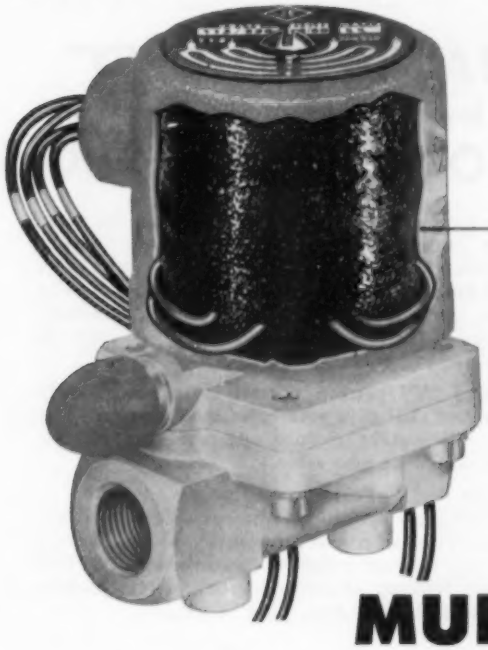
McQuay Inc.

1600 BROADWAY N. E.
MINNEAPOLIS 13, MINN.

HEATING • AIR CONDITIONING • REFRIGERATION

THIS ONE COIL IS ALL YOU NEED...

for most jobs!



The New

MULTI-VOLTAGE COIL

Fits all Standard "J-E" Solenoid Valves

NOW—from Jackes-Evans—you can get *one* coil assembly to do the job of many . . . *one* coil that is equally suitable for 115/25, 115/50, 115/60, 208/50, 208/60, 230/50 or 230/60 circuits . . . *one* coil that successfully operates to control the flow of Water, Air, Light Oils, Freon 12 and 22 (liquid, hot gas, suction), Brine, Industrial Gas, 5 lb. Steam, etc. . . . *one* coil that fits any standard "J-E" Solenoid Valve from 7/64″ to 1½″ port size and up to 225° F.

- **"J-E" MULTI-VOLTAGE COILS** have General Electric GEOPRENE insulated lead wires that will not dry out or crack. Extra resistant to oils, gasoline, etc. Wires are clearly *color-coded* for easy identification.
- **"J-E" MULTI-VOLTAGE COILS** are supplied with a unique new data plate incorporating a wiring diagram that shows the correct hook-up for each electrical requirement.
- **"J-E" MULTI-VOLTAGE COILS** are carefully layer-wound with magnet wire insulated with long-staple cotton thread. Heavily impregnated and oven-baked, using finest quality insulating varnish for superior moisture resistance and heat dissipation.
- **"J-E" MULTI-VOLTAGE COILS** have extremely low temperature rise—less than ½ of the allowable limit. Cooler operation assures much longer coil life.

Fully approved by Underwriters Laboratories

CUT INVENTORY COSTS . . . SAVE TIME and MONEY

. . . by stocking this new multi-use coil!

Takes care of seven different voltages—*eleven* common fluids and fits *forty-two* different valve styles and capacities—*a total of more than three thousand everyday applications that can be handled with this one coil!*

For further information on this outstanding new development . . . wire, phone or write

Controls Division

JACKES-EVANS MANUFACTURING COMPANY

4427 Geraldine Avenue • St. Louis 15, Mo.

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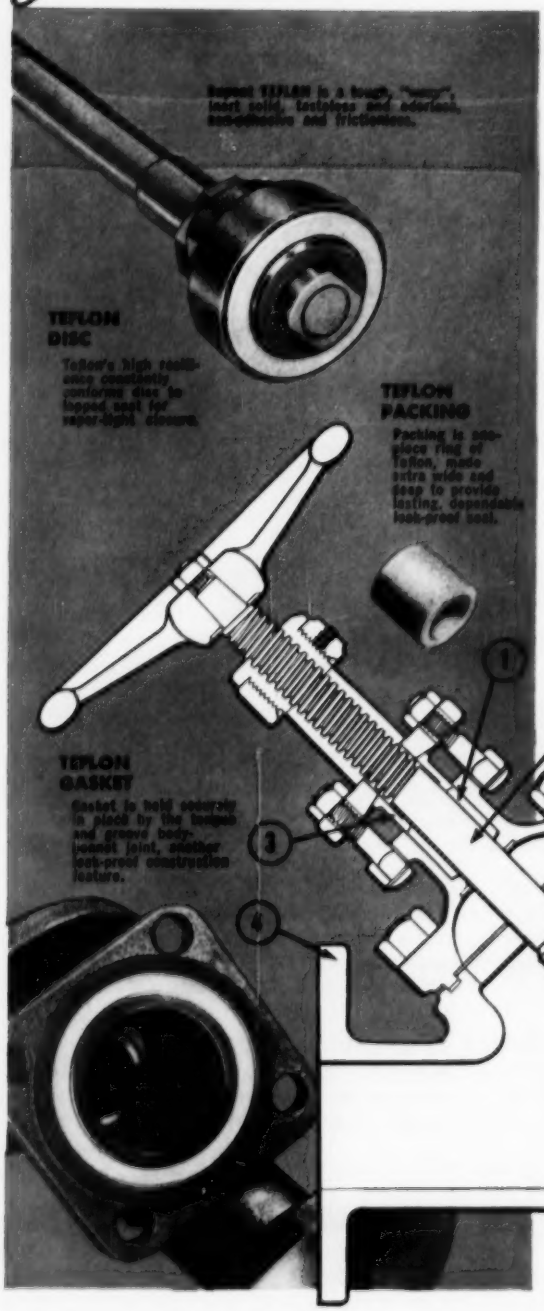
Jenkins designed for trouble-free performance . . . a



STAINLESS STEEL "Y"

to lower costs in a wider range of

CORROSIVE SERVICES

For food and chemcial plants, and similar services, Jenkins Fig. 1335 "Y" Globe offers many advanced features that will lower operating costs and keep your processing lines trouble-free. The disc, packing, and gasket are tough, resilient Teflon. Tasteless and odorless, it eliminates problems of contamination.

The "Y" pattern permits full flow, nearly equal to that of a gate valve, and also provides the vapor-tight closure and the ease of disc renewal of a globe valve.

Fig. 1335 offers extra value by any test . . . *initial cost, operating efficiency, low maintenance.* You can convert this extra value into *extra savings* on your toughest corrosive services. Call your Jenkins Distributor, or write: Jenkins Bros., 100 Park Ave., New York 17.

FULL, FREE FLOW through Fig. 1335 is nearly equal to flow through a gate valve.

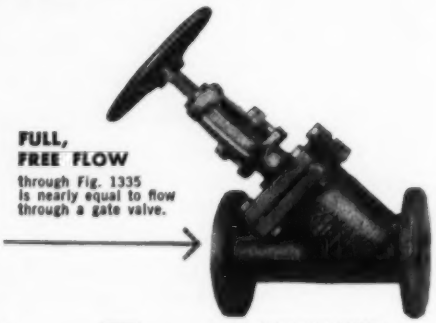


Fig. 1335 "Y" GLOBE
150 lbs. O.W.G. at 500°F
230 lbs. O.W.G. at 100°F
Sizes 1" to 4"

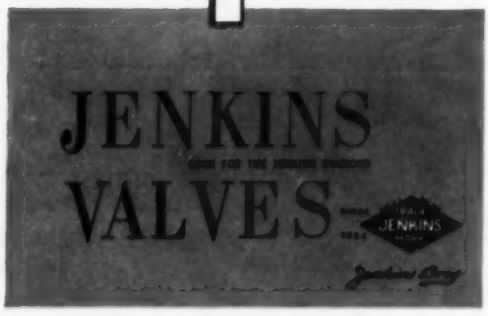
(1) **Packing Box**—Exceptionally deep and wide to hold optimum size packing.

(2) **Spindle**—Polished shank, long-operating threads, bevel shoulder for backseating.

(3) **Gland**—Two-piece for equalized pressure, tight seal.

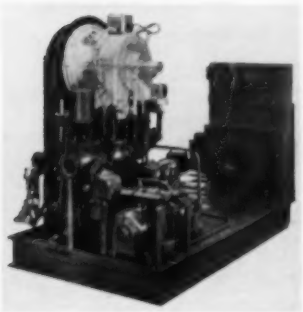
(4) **Flanges**—Conform to M.S.S. Standard Practice S.P.42 Specifications.

JENKINS STAINLESS STEEL VALVE BOOKLET illustrates and describes wide range of Jenkins Globe, Gate, Check, and Y Valves, includes selection data, survey forms. Ask for Form 200-A.



EQUIPMENT DEVELOPMENTS . . .

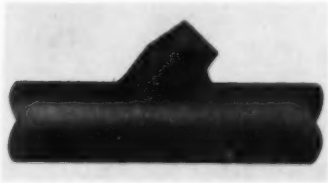
For reviews of Recent Trade Literature see Page 240



Combustion Assemblies . . .

. . . for modernizing or converting existing boiler or processing equipment or for obtaining efficient operation from new boiler or processing installations—*Orr & Sembower, Inc., Dept. HPAC, Reading, Pa.*

Utilize gas, oil or combination gas-oil firing. Systems include burner, controls, forced draft air supply, "full modulation" firing control, ignition, piping and wiring, refractory required for burner throat. In five sizes for maximum firing ratings 3 million to 25 million Btu per hr.



Fitting . . .

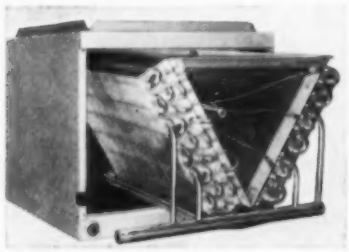
. . . for constructing angular branch connections with full penetration weld—*Bonney Forge & Tool Works, Dept. HPAC, 715 Meadow St., Allentown, Pa.*

"Elbolets" recommended by company for making 45 deg connections for directional flow and instrument connections, and for connections into elbows for instruments, drips, hangar and support connections.

Tape Coating . . .

. . . with film type, self disposing liner—*Tapecoat Co., Dept. HPAC, 1523 Lyons St., Evanston, Ill.*

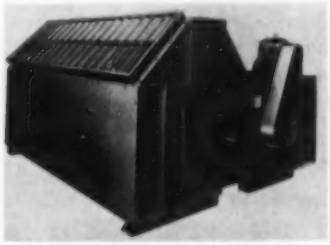
"Tapecoat-SP" coal-tar-pitch-base protection is said to permit easier, faster handling in field because it has wide temperature range, broadening its use. Liner disposed of "automatically" in torching application process. In widths 2 to 6 in., in rolls 45 to 50 ft long.



Plenum Coils . . .

. . . for use in hot climates—*Baker Mfg. Co., Dept. HPAC, 501 Galveston St., Wichita Falls, Tex.*

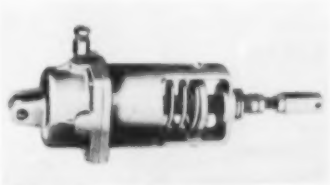
In 2, 3, 5 ton models, rated 800, 1200, 2000 cfm, respectively. Cited features: slide-out coil section; air splitter to provide even distribution of air to cooling coil; connections free of stack; insulated double drain pan; minimum number of transitions; adaptability of cabinet bottom to fit furnace opening.



Air Conditioner . . .

. . . for buildings requiring varying degrees of cooling, heating—*Trane Co., Dept. HPAC, La Crosse, Wis.*

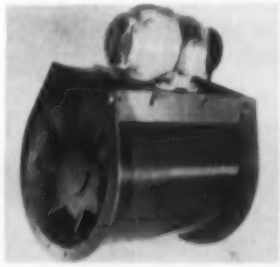
Redesigned "Multi-Zone Climate Changer" engineered to supply any combination desired; complete air conditioning, cooling only, heating only, cooling and ventilating, heating and ventilating, heating and humidification, ventilating only. In nine sizes with capacities 1700 to 29,000 cfm of air.



Diaphragm Motor . . .

. . . designed to provide gradual action—*Powers Regulator Co., Dept. HPAC, 3434 Oakton St., Skokie, Ill.*

New 3 in. "Powerstroke" unit operates on air, water or oil pressure, provides thrusts to 80 lb with maximum stroke of 2⅛ in. For gradual push-pull control of levers on industrial equipment and for heating, ventilating, air conditioning control. Also in 4, 6 in. sizes with 235 and 500 lb thrusts, 3 and 4⅛ in. strokes, respectively.



Plastic Axial Fans . . .

. . . for corrosive services—*Heil Process Equipment Corp., Dept. HPAC, 12901 Elmwood Ave., Cleveland 11.*

Rigid vinyl units designed for use with strong acid or alkali fumes at temperatures to 150 F. Glass reinforced plastic models recommended by company for most acid fume services, higher temperatures in 200 F range. In sizes 18, 24, 30, 36 in. and larger.

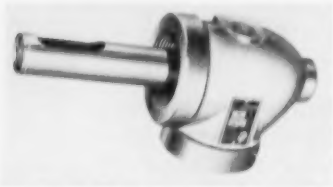
Condensing Units . . .

. . . for commercial refrigeration applications—*Copeland Refrigeration Corp., Dept. HPAC, Sidney, Ohio.*

"RCZ" units designed for use with remotely located air cooled condensers or in water cooled systems with cooling towers or evaporative con-

EQUIPMENT DEVELOPMENTS
Continued

densers. Models available for high, medium, low temperature applications in 1 to 5 hp, and for high temperature applications only in 7 ½ and 10 hp.



Air Control . . .

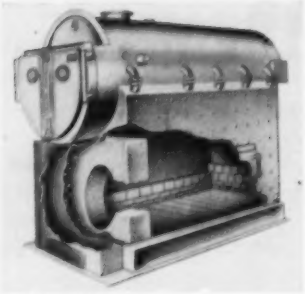
. . .for side outlet boilers—*Bell & Gossett Co., Dept. HPAC, Morton Grove, Ill.*

"Airtrol" system designed to control air in forced hot water heating installations. Operates as follows: boiler fitting traps air at boiler as it is released through heating, directs it to compression tank; tank fitting designed to enable installer to start up system initially with proper air level in tank, prevent air from leaving tank and returning to system.

Air Conditioners . . .

. . .with new design improvements—*Larkin Coils, Inc., Dept. HPAC,* 519 *Memorial Dr., S.E., Atlanta* 1.

Cited features: balanced air delivery to capacity at standard 400 cfm per ton; operation at high static pressure with extended ductwork; flexibility in choice of cooling and heating coils; large, two directional discharge grilles, increased filter area. Constructed of steel and finished with rust resistant primer and baked-on enamel, units insulated with glass fiber, have "frictionless" self aligning bearings encased in neoprene, use resilient base motors.



Steel Boilers . . .

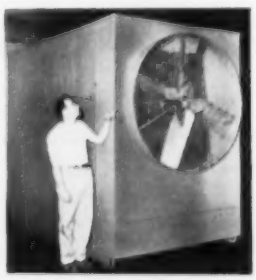
. . .for oil firing, designed to fill need for heating boiler with advantages of firebox boiler, plus having low water line and minimum space requirements—*Pacific Steel Boiler Div., National-U.S. Radiator Corp., Dept. HPAC, Johnstown, Pa.*

"LoSet" units for commercial, institutional, industrial installations requiring SBI low pressure steam ratings 4250 to 60,710 sq ft. SBI water ratings extend 6800 to 97,140 sq ft. Zone of combustion moved up into firebox.

Electrode . . .

. . .for all position welding of mild, low alloy steels—*Air Reduction Sales Co., Div. of Air Reduction Co., Inc., Dept. HPAC,* 150 *E.* 42*nd St., New York* 17.

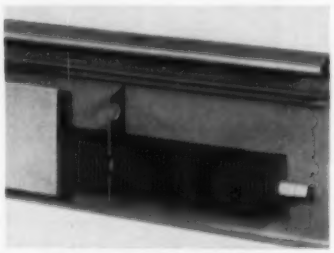
"Airco Easyarc 328" recommended by company for welding hardenable steels, cold rolled steels, low alloy or mild steels when stress relieving is required, weldments to be vitreous enamelled after welding. Cited features include: smooth arc action, low spatter loss, high welding speed due to iron powder added to coating, sound weld metal.



Cooling Tower . . .

. . .with 75 ton capacity—*Halstead & Mitchell, Dept. HPAC, Bessemer Bldg., Pittsburgh.*

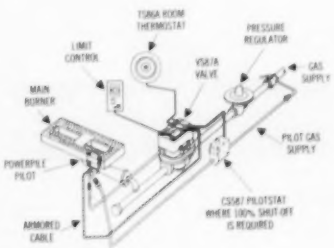
With pressure creosoted wetted deck wood. Uses four-blade, slow speed, zinc plated, chromate dipped fan, designed for quiet operation. Fan shafts made of stainless steel. Steel cabinet protected to eliminate rust, says company.



Baseboard Radiation . . .

. . .with single unit design for all-purpose installation, including free-standing, semi- or fully-recessed—*Rittling Corp., Dept. HPAC, Buffalo* 5.

Enclosure engineered to secure maximum stacking effect, efficient air handling for maximum heat transfer. Specially designed adjustable deflector-damper is standard equipment. Heating element uses ⅞ in. OD copper tube, rigid 0.017 in. steel fins. Fins are 2 × 3 in., spaced 48 per ft.



Controls . . .

. . .with "self energizing" feature—*Hydrotherm, Inc., Dept. HPAC, Northvale, N.J.*

Designed to provide uninterrupted service in cases of power failure. Is said to minimize installation costs by eliminating external electric wiring. Rated 750 millivolts.

Air Conditioner . . .

. . .for railroad cars—*Trane Co., Dept. HPAC, La Crosse, Wis.*

"Roll-out" unit designed to eliminate 50 percent of electrical power

NEW DEBOTHEZAT INDUCED DRAFT BIFURCATOR® CATALOG

all boiler code ratings expressed in BTU/HR

A valuable working tool for both the engineer and contractor. This new 20-page catalog gives all manufacturers' organizations boiler code ratings reduced to their common relationship of BTU/HR delivered to the steam.

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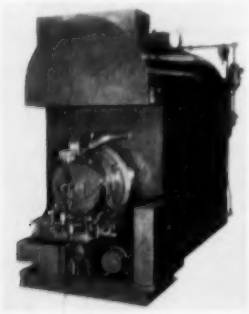
EQUIPMENT DEVELOPMENTS
Continued

requirements. Utilizes diesel engine as power source. For installation under cars. Includes integral extension tracks to allow it to be rolled out from beneath car for inspection, maintenance. Included in engine-compressor package are engine cooling system, fuel and lubricating oil filters, compressor controls, flexible refrigerant and fuel lines, electrical cables.



Firetube Boilers . . .

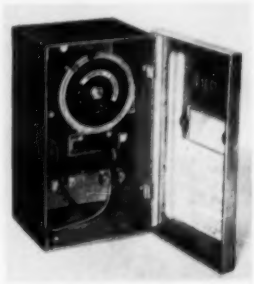
. . . with packaged design—*York-Shipley, Inc., Dept. HPAC, York, Pa.*

Design eliminates need for stack, pitting, brickwork, says company. Four-pass arrangement of boiler tubes is said to assure maximum heating efficiency. Units furnished to supply low pressure steam (15 psi), hot water (30 psi). For Nos. 3, 5 or 6 oil and/or natural or manufactured gas. Can be converted to coal firing. In equivalent net steam ratings 3000 to 35,000 sq ft, equivalent net water ratings 4800 to 56,000 sq ft.

Ventilator Unit . . .

. . . for "low contour" installation—*Swartwout Co., Dept. HPAC, 18511 Euclid Ave., Cleveland 12.*

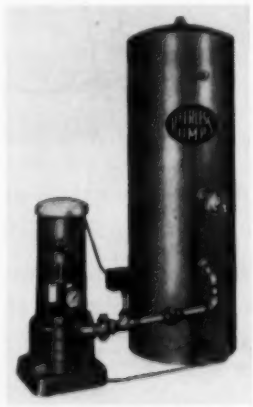
"Low-Line" rectangular shaped unit designed on principle of deflecting expelled air downward to roof. In 11 throat sizes, in both gravity and powered models. Powered unit also available as air intake.



Time Switches . . .

. . . for double-pole, double-throw service—*Tork Clock Co., Inc., Dept. HPAC, Mt. Vernon, N.Y.*

Recommended by company for applications requiring transfer from one circuit to another, controlling of mechanically held contactors or motorized valves, alternation from high to low heating control. In four basic dial styles; standard 24-hour *on-off*, astronomic, skip-a-day, seven-day.



Multistage Jet Pumps . . .

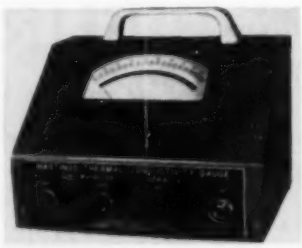
. . . in three-, four-, five-stage deep and shallow well models—*Peerless Pump Div., Food Machinery and Chemical Corp., Dept. HPAC, 301 W. Ave. 26, Los Angeles 31.*

For continuous duty, single and double pipe jet pumping systems designed to produce to 3200 gph from deep wells, to 2200 gph from shallow. Cited features: sealed ball bearing motor; new type ceramic plastic shaft seal; heavily constructed mounting bracket; bronze alloy impellers; glass pressure gage.

Air Conditioners . . .

. . . for stores, office buildings—*Crane Co., Dept. HPAC, 836 S. Michigan Ave., Chicago 5.*

In two lines: "SU" series includes 3, 5, 7½ ton models; "MU" series in 10, 16 ton sizes for heavier duty. "SU" packaged conditioners are single refrigerant systems with one hermetic compressor, water cooled condenser, cooling coil. Air discharge grille can be attached to front or top of unit, or ducts can be attached by removing grille. "MU" series units shipped in two packages — refrigerant section and blower section. Blower section can be mounted at top or side of refrigerant section.



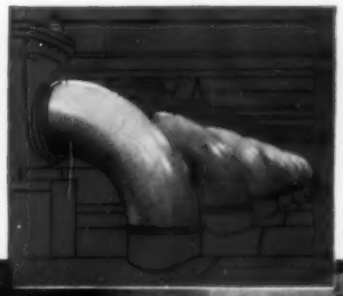
Gage . . .

. . . for determining thermal conductivity of gases—*Hastings-Raydist, Inc., Dept. HPAC, Hampton, Va.*

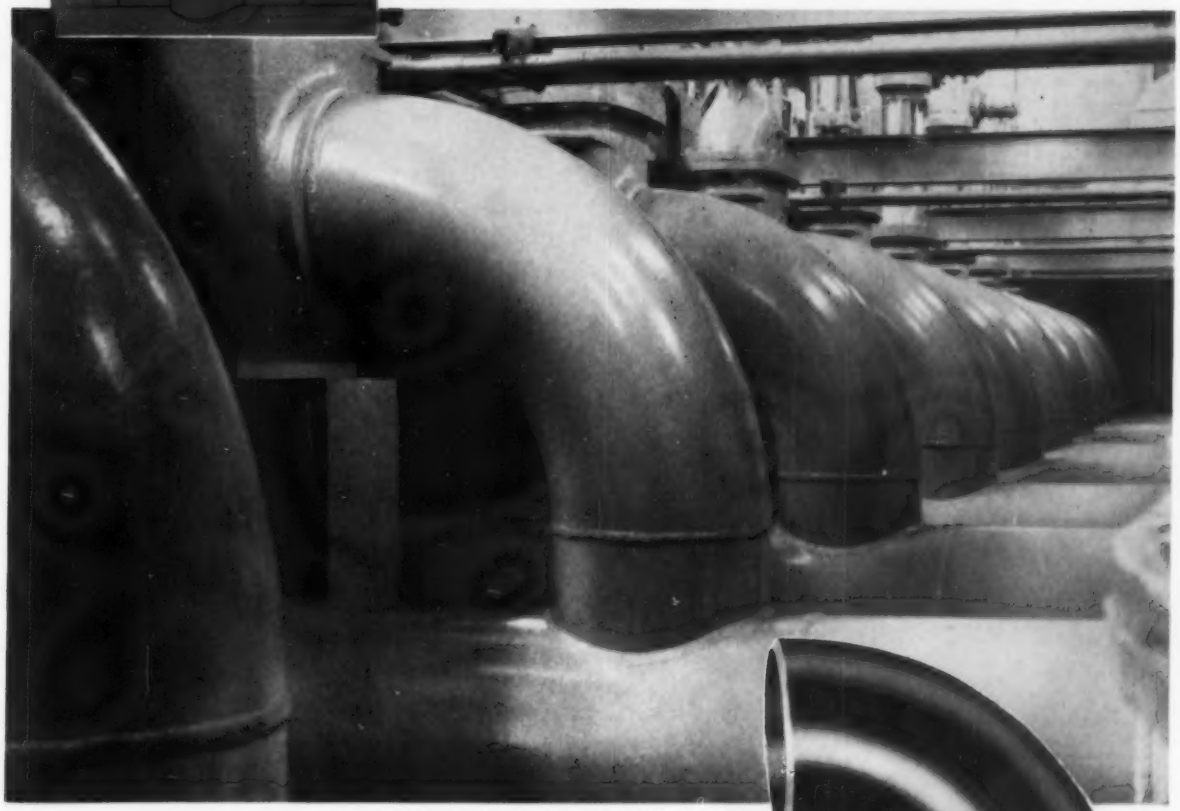
Based on compensated thermopile principle, unit is said to allow more accurate measurements without instability, temperature effects. Incorporates six noble metal thermocouples, arranged to compensate for temperature changes in gas, rate of change of temperature effects. Recommended by company for use in chemical analysis of gases and in detection of explosive gases, vapors.

Relief Valve . . .

. . . with integral dual control—*A. W. Cash Valve Mfg. Corp., Dept. HPAC, 666 E. Wabash Ave., Decatur, Ill.*



These B&W Elbows Need Less ELBOW ROOM



ELBOW room was at a premium in this piping manifold. Fabricators chose B&W Fittings because they're easy to install, especially in a job like this which calls for "close-quarter" welding. Installation went ahead fast and without trouble, thanks to the accurate dimensions of the B&W Welding Ells used.

Maintenance, too, will be kept at a minimum because, with a sound weld, piping is permanent and leakproof. B&W Seamless Welding Fittings and Flanges are available in a complete range of grades, types, sizes and pipe schedules.

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No other pipe insulation is so easy and inexpensive to handle and apply as this unique one-piece pipe insulation molded of fine glass fibers! Lightweight, resilient and rugged, Snap*On is virtually unbreakable — a fact that permits workers to handle and apply it with unprecedented ease and speed. Other advantages:

- **Highest thermal efficiency** of any insulation for cold or hot piping up to 350°.
- **Lowest applied cost** — just spread the single seam and it snaps on the pipe.
- **Permanent** . . . yet reusable.

Available plain or jacketed, in 3′ or 6′ sections in sizes up to 33″. Local stocks maintained by a nation-wide network of distributors. **See adjoining column for local distributor.**

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See Adjoining Column for Local Snap*On Distributor →

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(See ad on facing page)

ALBUQUERQUE, Mt. States Insulation Co.
AMARILLO, Ball Distributing & Engr. Co.
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BILLINGS, Mont., L. W. Worthington
BIRMINGHAM, Ala., Shook & Fletcher Supply
Southern States Iron Roofing Co.
BROOKLINE, Mass., Homans-Kohler, Inc.
BUFFALO, Frontier Insulation & Supply Co.
CHARLESTON, W. Va., Baldwin Asbestos Products Co.
CHARLESTON HEIGHTS, S. C., Stafford Insulation Co.
CHICAGO, E. C. Carlson Co.
CINCINNATI, R. E. Kramig & Co.
CLEVELAND, The Miles Materials Co.
COLUMBIA, S. C., Southern States Iron Roofing Co.
COLUMBUS, Santeler Brothers
DALLAS, Insulation Supply Co., Inc.
DAVENPORT, Republic Electric Co.
DENVER, Gene Wright Lumber Co.
DETROIT, Coon-DeVisser Co.
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GREENSBORO, N. C., Starr Davis Co., Inc.
HOUSTON, Precision Insulation Co.
INDIANAPOLIS, Central Supply Co.
IRON MOUNTAIN, Mich., Champion, Inc.
JACKSON, Miss., Machinery Sales & Service Co., Inc.
JOPLIN, Mo., Joplin Cement Co.
KANSAS CITY, Kelley Asbestos Co.
LITTLE ROCK, Gunn Distributing Co.
LOS ANGELES, Western Fibrous Glass Products
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MADISON, Wis., J. D. Wilson Co.
MEMPHIS, John A. Denie's Sons Co.
MIAMI, Southern States Iron Roofing Co.
MILWAUKEE, J. D. Wilson Co.
NASHVILLE, Southern States Iron Roofing Co.
NEW HAVEN, Conn., Insulation Supply Co.
NEW ORLEANS, Eagle Asbestos & Packing
NEW YORK, Eastern Steam Specialty Co.
OKLAHOMA CITY, Ball Distributing & Engineering Co.
OMAHA, Cardinal Supply & Mfg. Co.
PHILADELPHIA, John F. Scanlan, Inc.
PITTSBURGH, D. J. Kennedy Co.
PHOENIX, Ariz., Kircher Asbestos & Rubber Co.
RALEIGH, N. C., Southern States Iron Roofing Co.
RICHMOND, Va., Southern States Iron Roofing Co.
ROCKFORD, Ill., Mott Brothers Co.
SALT LAKE CITY, Bullough Asbestos Supply Co.
SAN ANTONIO, The Bracken Co.
SAN DIEGO, Western Fibrous Glass Products
SAN FRANCISCO, Western Fibrous Glass Products
SAVANNAH, Ga., Southern States Iron Roofing
SCHENECTADY, N. Y., Jon Tree Sales & Supply Co.
SEATTLE, Western Fibrous Glass Products
ST. LOUIS, A. G. Brauer Supply Co.
ST. PAUL, Asbestos Products, Inc.
SYRACUSE, N. Y., Industrial Supply Co.
TAMPA, Fla., Eagle Roofing & Art Metal Works, Inc.
TALLAHASSEE, Fla., Capital Refrigeration & Supply
TULSA, Okla., Ball Distributing & Engr. Co.
WASHINGTON, Walter E. Campbell Co., Inc.
WICHITA, Jamar-Olmen Construction Co.
VANCOUVER, B. C., Fleck Brothers Limited

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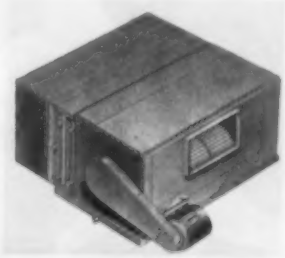
EQUIPMENT DEVELOPMENTS

Continued

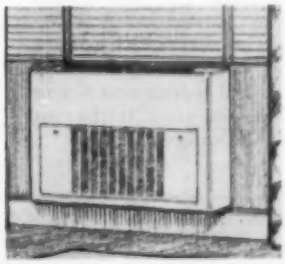
ASME listed. Recommended by company for hot water space heating installations. In 10 different models, designed to provide positive pressure control, protection from thermal expansion, emergency generated steam. In sizes ½ × ½ in. and ½ × ¾ in. Relief capacities are 264,600 and 324,000 Btu per hr.



Air Handling Units . . .

. . . for ventilating, heating, air conditioning—*Sturtevant Div., Westinghouse Electric Corp., Dept. HPAC, Hyde Park, Boston* 36.

In 13 basic sizes for handling 500 to 48,500 cfm of air. Constant air flow assured by deep, closely spaced, forwardly curved blades, says company. Designed for minimum space requirements. Complete line features standard blast and steam distributing coils, direct expansion and water heating and cooling coils.



Air Conditioner . . .

. . . in cabinet type unit for heating, cooling—*Warren Webster & Co., Dept. HPAC, Camden* 5, *N.J.*

Recommended by company for modernization of hotels, office buildings, apartments, motels, similar structures. May be installed room-by-room or floor-by-floor. Heating coil connected to existing steam or forced hot water heating system. Self con-

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Extended Surface, copper tube, gas fired

HOT WATER BOILER of ADVANCED DESIGN

3 times the BTU's per pound of weight

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Notice the simplicity and saving in fittings.

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Notice how bottom inlet requires complicated piping.

FREE TRAP SELECTOR BOOKLET!

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SUPER-SILVERTOP STEAM TRAPS

EQUIPMENT DEVELOPMENTS
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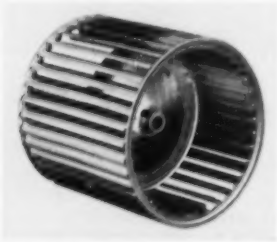
tained, air cooled, hermetic refrigeration cycle provides cooling, dehumidification.



Blower Wheel . . .

. . . with center disc design—*Torrington Mfg. Co., Dept. HPAC, Torrington, Conn.*

Structural center disc of unit is dovetailed under pressure into encircling blades, forming compression fit. Feature is said to eliminate looseness, blade rattling, blade angle warp. Permits operation at higher speeds than conventional blower wheels, says company. In six sizes with diameters 9½ to 12⅝ in.

Rubber Tubing . . .

. . . insulation for cold water lines—*Rubatex Div., Great American Industries, Inc., Dept. HPAC, Bedford, Va.*

Designed especially to stop condensation on copper formed cold lines. Can be slipped on or, on existing cold carriers, can be slit lengthwise, snapped around piping, sealed with specially formulated adhesive. Nitrogen filled, closed cellular structure is said to repel water, moisture indefinitely. With ⅜ in. minimum inside diameter, in lengths to 250 ft.

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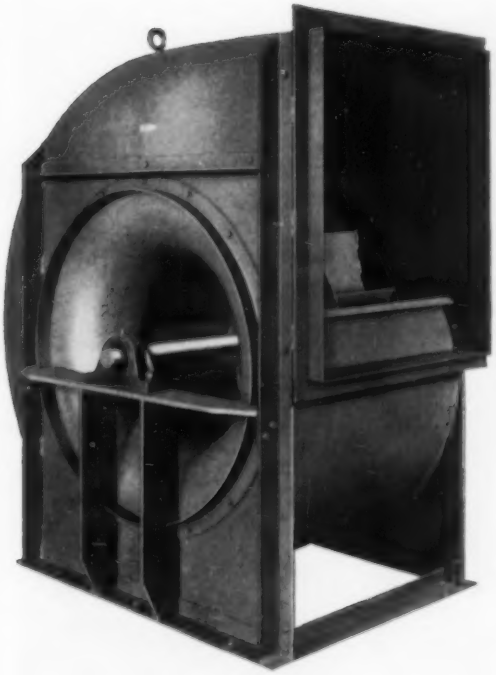

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Two types of fan wheels. Housing dimensions remain the same but performance characteristics differ.

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Quiet operating, medium speed (IPL) wheels with non-overloading horsepower characteristics for heating, ventilating and air conditioning or industrial applications. Wheel diameters from 15 inch to 73 inch, with any speed or discharge required. Capacities up to 123,000 cfm. Class I, II, or III construction.

All-welded housing featured as standard construction for simplicity, extra strength and rigidity—dust tight and leak proof. Bolted (knock-down) type available in Class I and Class II. Split housing can be furnished as extra if required.

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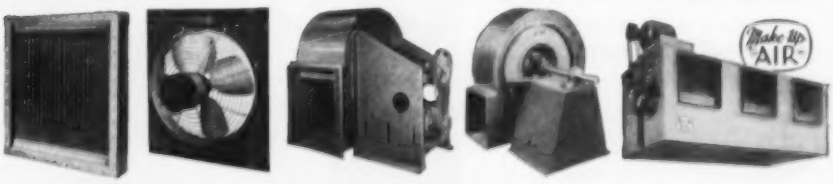

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*Registration applied for.

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JALZINC is Jones & Laughlin's new trade name for its *high quality* zinc coated steel sheet and coiled product. JALZINC answers your toughest forming, rolling and drawing problems.

Produced by the proven Sendzimir process, JALZINC has a tight, uniform coating that resists cracking and flaking. The high lustre finish greatly improves the appearance of your end product. JALZINC is available in a wide range of gages and widths in both cut lengths and coils.

Users are enthusiastic about JALZINC'S uniform ductility, flatness and surface finish. Write today for complete details.

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☐ Please have J&L representative call

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EQUIPMENT DEVELOPMENTS
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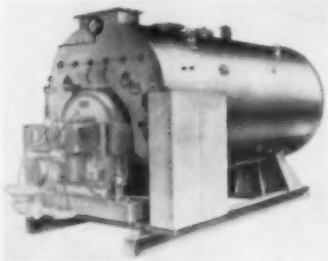
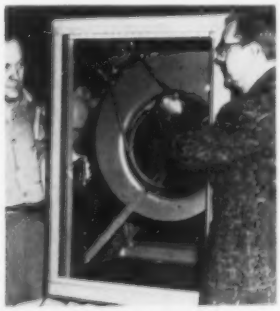


Heating Boilers . . .

. . . for firing with natural or forced draft gas or oil burners—*Heating and Air Conditioning Div., National-U.S. Radiator Corp., Dept. HPAC, Johnstown, Pa.*

Scotch type units in 26 models. Are said to meet heating, hot water supply requirements of commercial, institutional, industrial installations. "SN" units available in 13 sizes for use with popular makes of commercial sized oil or gas burners employing natural draft. Net SBI steam ratings: 4500 to 35,000 sq ft. Net SBI water ratings: 7200 to 56,000 sq ft. "SF" line, for forced draft oil, gas or gas-oil firing, also in 13 sizes, with net steam ratings 6440 to 50,000 sq ft, net water ratings 10,300 to 80,000 sq ft.



Rubber V-Belts . . .

. . . with built-in spring action—*B.F. Goodrich Industrial Products Co., Dept. HPAC, Akron.*

"Vibrasorb" belts are said to absorb 24 percent more vibration than those presently rated as low vibration belts. By isolating and absorbing vibration, belts minimize transmission of vibration from one pulley to another, says company. Shown is belt on air cooler, manufactured by *Wright Mfg. Co., Phoenix.*

ENDS MAINTENANCE
in general pump service

Single-stage, double suction DMV-DHV general hydraulic pumps are available for heads to 350 ft., capacities from 275 to 2400 gpm.

Double shaft seals and sealed ball bearings—standard equipment on **DMV— DHV** *pumps do away with stuffing box attention and bearing lubrication*

Now, with the DMV-DHV pump, you no longer have any stuffing box worries. There's no repacking! No annoying pump shaft leaks! The Double Mechanical Shaft Seals used are completely self-adjusting. They don't require attention throughout their entire service life.

Moreover, greasing or oiling of pump bearings is done away with. Modern Cartridge-Type Ball Bearings are employed—with the lubricant permanently sealed in. Here's another advanced feature that makes the DMV-DHV design the simplest, most maintenance-free pump ever developed by Ingersoll-Rand for general hydraulic service.

Greater Compactness is obtained with this modern construction using mechanical shaft seals and sealed bearings.

See your nearest Ingersoll-Rand representative for further information.

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MAINTENANCE-FREE LIMA MOTORS

IN ALL NEW NEMA FRAME SIZES

- 30% LESS WEIGHT PER HORSEPOWER
- 30% VOLUMETRIC SIZE REDUCTION
- DUAL FANS INTEGRALLY CAST WITH ROTOR
- COMPLETE ROTOR ASSEMBLIES DYNAMICALLY BALANCED
- RIGID, CAST IRON FRAMES WITH INTEGRALLY CAST FEET
- DIAGONALLY SPLIT CAST ALUMINUM CONNECTION BOXES—CADMIUM PLATED COVER SCREWS
- TOTALLY ENCLOSED FRAMES MEET J.I.C. SPECIFICATIONS

Slash maintenance costs and eliminate costly inspection and lubrication programs with Lima Motors in NEW NEMA frame sizes. With lubricated-for-life DOUBLE-WIDTH ball bearings, solid die cast aluminum rotors with dual integral fans, and Mylar insulation . . . Lima gives you higher full-load speeds with the most complete motor protection available. Install these new Finest Quality Lima Motors—and forget them.

Lima now has in production all ratings in new NEMA frame sizes 182 through 326U. Get complete details on Lima's new NEMA *maintenance-free* motors from your Lima Representative now! If he is not already calling on you, his name and address will be found in *Thomas' Register, MacRae's Blue Book or Conover-Mast Purchasing Directory*.

Of course, Lima will continue to produce regular NEMA frame sizes 66 to 505 (⅓ to 150 H.P.), incorporating the latest advances in motor design.

THE OLD WAY
Open and unprotected motor bearings subject to contamination and must be inspected and lubricated frequently.

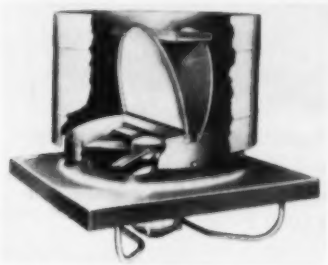
THE LIMA WAY
Sealed and protected—Lima's DOUBLE-WIDTH pre-lubricated motor bearings require no attention—just put the motor to work and forget it.

THE LIMA ELECTRIC MOTOR COMPANY, 4991 Findlay Road Lima, Ohio

FIRST . . . FOR MOTORS . . . DRIVES . . . SPEED REDUCERS

EQUIPMENT DEVELOPMENTS

Continued



Roof Ventilator . . .

. . . with airfoil fan blades welded to specially designed hub for maximum exhaust of heat, smoke, dust, fumes at low rpm—*Detroit Blower Co., Dept. HPAC, 9867 Pacific Ave., Franklin Park, Ill.*

When fan is off, dampers weather-seal ventilator against elements, says company. Units available with fusible link device which acts as emergency damper during fires. Exposed to heat, link breaks allowing dampers to open and smoke and heat to escape. In eight sizes with blade diameters 24 to 60 in., exhaust capability range is 6640 to 53,700 cfm.

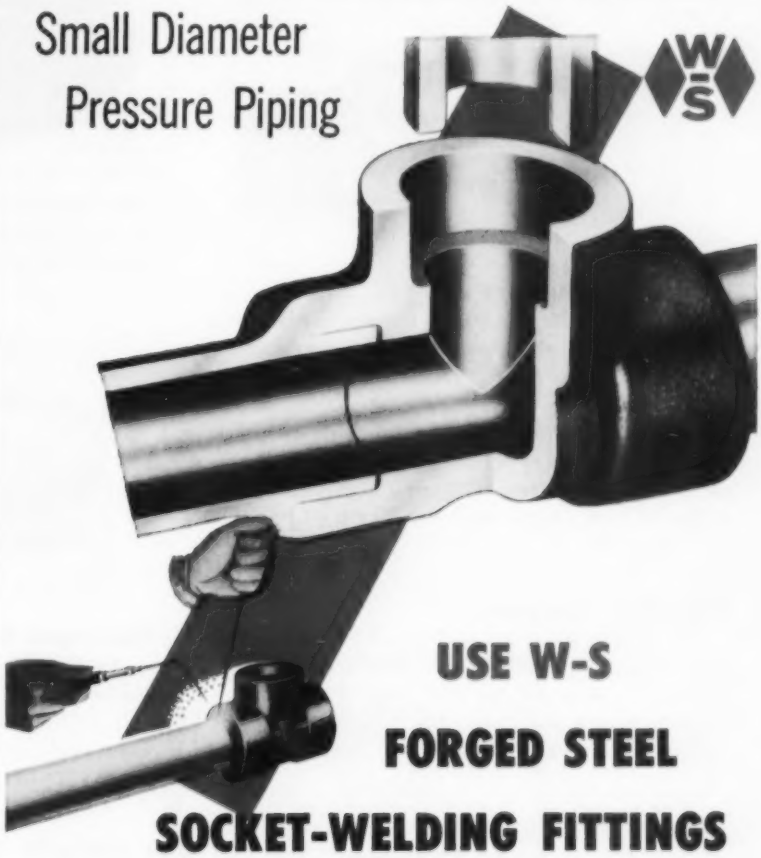
Hermetic Gage Port . . .

. . . with detachable design—*Mechanical Refrigeration Enterprises, Dept. HPAC, 4715 Lankershim Blvd., North Hollywood, Calif.*

Recommended by company for use in testing, charging, purging hermetic refrigeration systems. Midget, two-part "Tapaline, Jr." fits tube sizes 1/4, 5/16, 3/8 in. Master valve locks saddle member to checking spot, then unscrews for re-use at later time. Saddle remains.

Here's the **EASY WAY TO WELD**

Small Diameter Pressure Piping



USE W-S FORGED STEEL SOCKET-WELDING FITTINGS

In addition to providing high strength and toughness, W-S Forged Steel Socket-Welding Fittings are also easy to install. Deep sockets support and align the pipe for welding . . . eliminating the need for tack welding or special fixtures. No back-up ring is needed either. The fillet-weld is completely outside the pipe. Welding icicles just can't form inside the pipe. The result is a clean, tight welded joint that will readily resist high pressures and the stresses of shock and vibration. What's more, installation costs are lower.

W-S Socket-Welding Fittings are available in sizes ⅛" to 4" for schedule 40, 80, 160 and double-extra heavy pipe in carbon steel, stainless steels and alloy steels.

For complete information on the installation and operation advantages of W-S Forged Steel Socket-Welding Fittings, send today for Bulletin A-3-56.

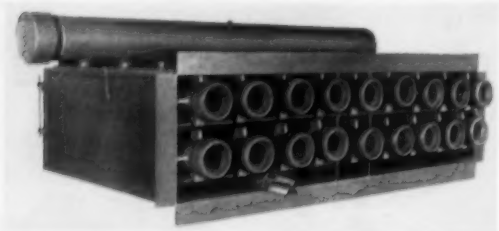
W-S FITTINGS DIVISION

H.K. PORTER COMPANY, INC.

Roselle, New Jersey

EQUIPMENT DEVELOPMENTS

Continued



Inshot Gas Burners . . .

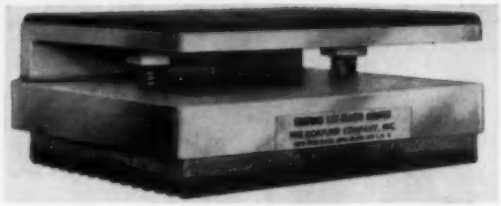
. . . designed to burn natural, manufactured, mixed gases in commercial, industrial applications—*Ray Oil Burner Co., Dept. HPAC,* 1301 *San Jose Ave., San Francisco* 12.

Number and arrangement of nozzles on atmospheric type units are said to permit flexibility in design, capacity where requirements demand high input rating in limited space. Capacities range 99 cfh on 1000 Btu gas to 7512 cfh.

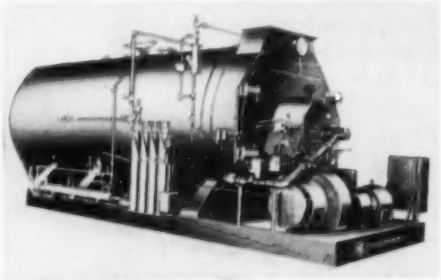
Vibration Damper . . .

. . . designed to speed installation and relocation of all types of equipment, stop vibration transmission, lower noise levels—*Korfund Co., Inc., Dept. HPAC,* 48-*OIF* 32*nd Pl., Long Island City* 1, *N.Y.*

Cited features of "LevElasto" unit include: internal



leveling adjustment permitting installation anywhere under machine; no adjusting bolts protruding from top of mounting; nonskid felt pad on top plate. In nine sizes for loads 65 to 12,000 lb per damper.



Packaged Boiler . . .

. . . rated 750 hp—*Cyclotherm Div., National-U.S. Radiator Corp., Oswego, N.Y.*

Is said to be highest capacity packaged firetube boiler made. Delivers 26,000 lb per hr of steam at over

. . . you can no longer afford to do it by HAND

Save Time, Cut Job Costs

Cutting, Threading, Reaming Pipe with this Extra-Speedy

RIDGID 400A Power Drive

with SPEED CHUCK . . . instant grip, forward, reverse

More work more easily when this powerful little power drive turns pipe, conduit or rod for your hand tools. Rapid action Speed Chuck guaranteed to hold tight forward or reverse; replaceable jaw teeth for long life. Light, compact, portable. Buy it at your Supply House.

Capacity: ⅛" to 2" pipe, conduit; to 12" with geared tools; ¼" to 2" bolts.

RIDGID 504 for Power Threading

Quick-opening self-contained 1" to 2" threader for faster threading with power drive. Easy setting to size.

RIDGID Work-Saver Pipe Tools

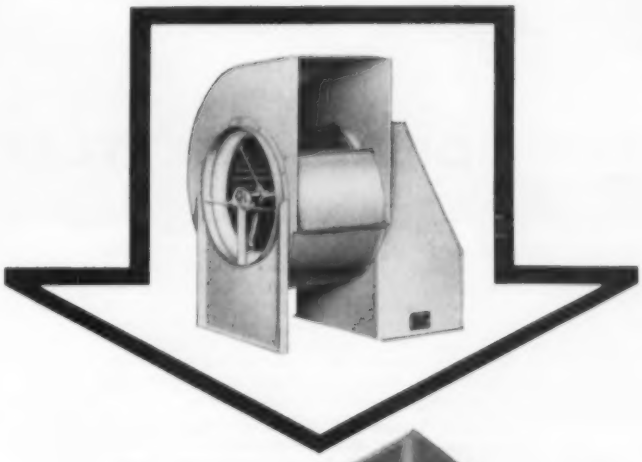
The Ridge Tool Company • Elyria, Ohio, U.S.A.

"top" installations needn't mean sky-high costs

Why bother your head trying to solve the problem of "the forgotten fan" when Utility has solved it for you — and profitably, too.

It's a fact that wind and the weather play havoc with roof blowers, causing breakdowns from exposure and lubrication neglect. But today Utility has the answer ready in a full series of Enclosed Drive Blowers designed to stand the outdoor gaff. All have motors and drive completely enclosed for positive protection against dirt, moisture and drastic temperature changes. Pre-greased, permanently sealed ball bearings prevent breakdowns due to hit-or-miss maintenance . . . mean year after year of faithful outdoor service.

This feat of common-sense engineering is just another example of Utility's attention to the important details that mean functional excellence in the product, low cost for the customer, a high margin of profit for you. So plan with Utility for maximum service — and profit — on every job!



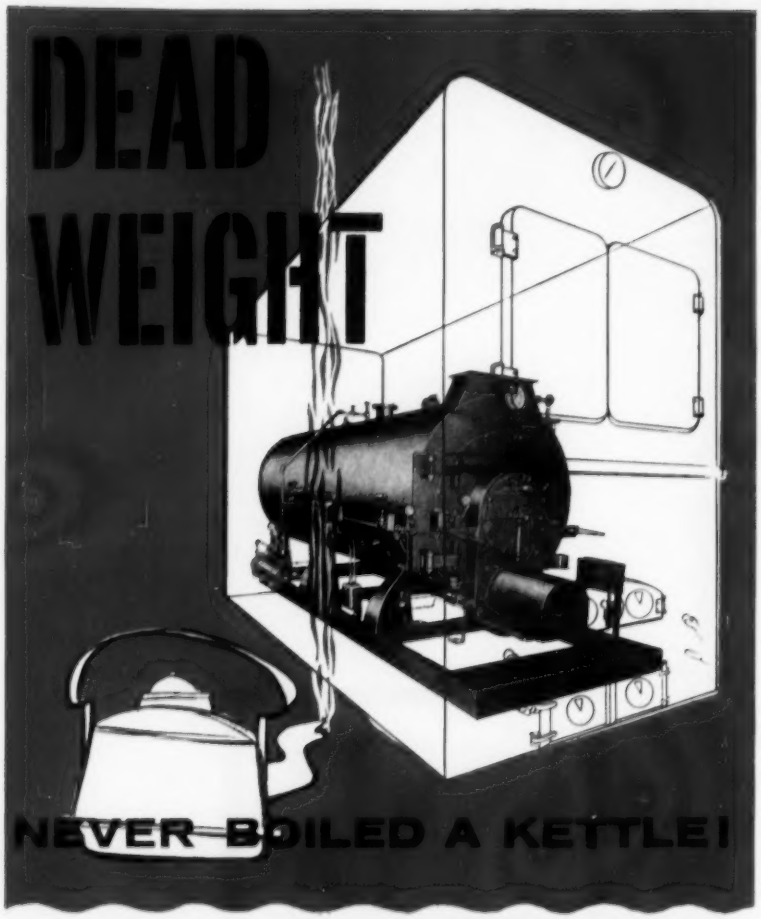
A Division of Utility Appliance Corp.

UTILITY FAN CORP.

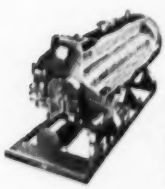
911 East 59th Street, Los Angeles 1, California

UTILITY

Manufacturers of heavy and standard duty blowers for heating, air conditioning and ventilating installations. Producers of blowers and blower parts for original equipment manufacturers. Write for catalogue data.



THERE'S no practical use for the excess weight and bulk of the conventional steam and hot water generator, with its maze of tubes, passes and refractory baffles. The Cyclotherm design incorporates just 2 passes to give you a guaranteed minimum efficiency of 80%. Complete combustion with uniform heat-transfer in the first pass utilizes approximately 65% of your fuel value; the balance is transferred in the second pass. *Fifty* passes would accomplish no more. Cyclotherm *is* compact—up to ⅓ smaller than other packaged steam generators.



CYCLOTHERM Steam and Hot Water Generators are designed, engineered and constructed in the Cyclotherm plant to give you the finest in packaged steam or hot water generators. Factory insulation with fiberglas plus aluminum jacket saves up to $600 in field-insulation. Every unit test-fired before leaving the factory. The Cyclotherm reaches you completely assembled — five simple connections and it is ready to go to work. No expensive stack required; no special foundation. Up to 50% saved in maintenance costs by simplified design and by electronic control system that automatically operates Cyclotherm as load requires.

MANY plants have installed two or more Cyclotherms for maximum flexibility and power. Cyclotherm stands back of its product with sales engineers close by whenever you need them. Fifteen models, from 18 to 500 hp (15 to 200 psi). For full information on a boiler that represents the most advanced engineering in steam generation, mail the coupon today.

YEARS AHEAD IN STEAM GENERATION
CYCLOTHERM®
Steam & Hot Water Generators

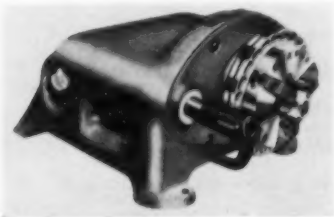
Cyclotherm Division
National-U.S. Radiator Corp.
2631 E. First St.
Oswego, N. Y.

Send me free copy of your complete booklet on Cyclotherm Steam and Hot Water Generators

EQUIPMENT DEVELOPMENTS

Continued

80 percent efficiency, says company. "Cyclonic Combustion" principle facilitates size no larger than most 500 hp packaged generators. Designed for heavy oil or gas, can be adapted to burn LP gas or light oil, also.



Power Drive . . .

. . . designed to be capable of delivering power output of heavy duty machine—*Beaver Pipe Tools, Inc., Dept. HPAC, Warren, Ohio.*

"Porto-Mite Super Drive" has gears lubricated for life of unit; fast, powerful, durable motor; "Power Grip" wrenchless chuck as standard equipment; fully protected motor switch, says company.

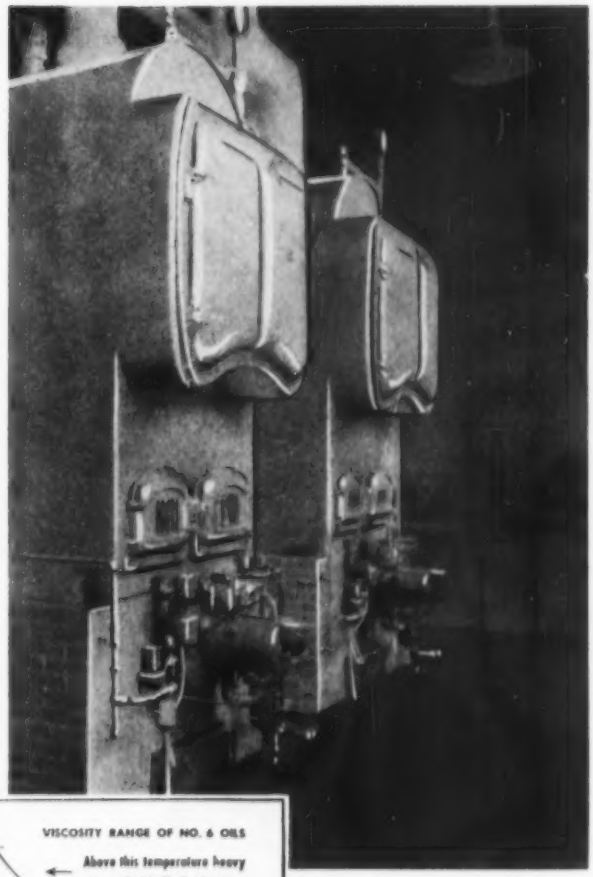
Solid Shaft Motor . . .

. . . with vertical design—*U.S. Electrical Motors, Inc., Dept. HPAC, Box 2058, Terminal Annex, Los Angeles.*

Newly designed "Type HV" unit is said to be more compact than previous models for its horsepower rating. Available 1 to 10 hp. (Soon available to 30 hp.) In NEMA styles "C" or "P" base. Vertical shaft connection for directly applied power simplifies hookup, unitizes motor with driven machine, says company.

DEPENDABILITY

the one thing in heating you dare not overlook



Heating plant in the Midvale School, Madison, Wis. The two Petro rotary oil burners are equipped for automatic modulating flame control.

Petro rotary oil burners are dependable because of their simple design and sound, rugged construction

Sluggish heavy oil (No. 6) is easily controlled by a system that is remarkably free from mechanical "gimmicks." It's like this:

1. A simple oil heater automatically warms the oil to a point where viscosity is constant. (See chart.)
2. A magnetic valve passes the oil to the nozzle when it is warm enough for accurate metering and instant ignition.

That is the basic idea of the Petro Thermal Viscosity Principle. It isn't fancy; it isn't temperamental; but it STAYS ON THE JOB. Petro owners need not be impressed by metering pumps, viscosity compensating valves, or other complicated mechanisms found in many burners.

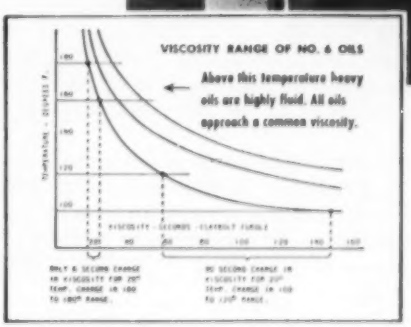
All this and fuel economy too

Petro oil burners have been the steady, reliable work horses in heavy oil firing for over 50 years. They have saved their owners untold thousands of dollars by efficient firing of the viscous industrial oils, which cost less per gallon, and are richer in heat value than the light oils.

Gas-oil models also available

The ability to switch fuels at a moment's notice protects against fuel emergencies and cuts fuel costs. Any Petro rotary oil burner (including those now in use) can be readily combined with the Petro gas burner, providing a dual-fuel firing system in a single integrated unit.

For further information use the accompanying coupon, or look in the yellow telephone directory pages under Oil Burners for name of your Petro dealer.



PETRO

T. M. REG. U. S. PAT. OFF.

OVER 50 YEARS OF LEADERSHIP IN AUTOMATIC HEATING AND POWER EQUIPMENT

PETRO
3250 West 106th Street, Cleveland 11, Ohio.
(In Canada: 2231 Bloor Street W., Toronto, Ontario.)

Please send me literature and specification sheets on money-saving Petro commercial and industrial burners.

Name_____

Company_____

Address_____

City_____ State_____

RUGGED, DEPENDABLE, ACCURATE

USG GAUGES

for *Every* heating and air conditioning application

The Fig. 500 is typical of the USG gauges used in heating and air conditioning applications.

With its cast iron case, wide bearing areas and movement made of dissimilar metals . . . the entire design is engineered for long service and minimized maintenance. Moreover, the cost is low . . . well below the price that might be expected for a gauge of its quality. Dial sizes range from 4½" to 12"; pressures from 0-15 to 0-1000 psi.

For some applications, contractors may prefer a lighter weight, drawn steel case gauge of the Fig. 500S series. These are also available for pressures up to 1000 psi, but in dial sizes from 2" to 4½".

Whether you buy as a contractor, or specify as an engineer, you'll be certain of quality and performance with USG gauges. As a manufacturer, buying gauges to be sold as a component of your heating or air conditioning equipment, you'll find it advantageous to do as 6 of 10 such manufacturers do . . . specify USG.

Your USG distributor has in stock, or can get for you, any quantity of any of the 50,000 gauges made by USG for all types of installations.

Write us for the name of the distributor in your area.

UNITED STATES GAUGE

Division of American Machine and Metals, Inc.
Sellersville, Pa.

Home of the SUPERGAUGE

EQUIPMENT DEVELOPMENTS

Continued

Flow Control Valves . . .

. . . designed to fill need for valves capable of withstanding wide range of working pressures, temperatures—*Uniflow Valve Corp., Dept. HPAC, 19 Quine St., Cranford, N.J.*

Has semi-steel topworks with diaphragm operators for *on-off* or 3-15 lb control, air to open, or air to close. Has adjustable spring, Teflon packing with screwed bonnet. Bodies are bar stock with screwed ends, straight through or angle type with removable seats and spline plug. Body ratings to 15,000 psi in steel. In sizes ¼ to 1 in.

Plastic Pipe . . .

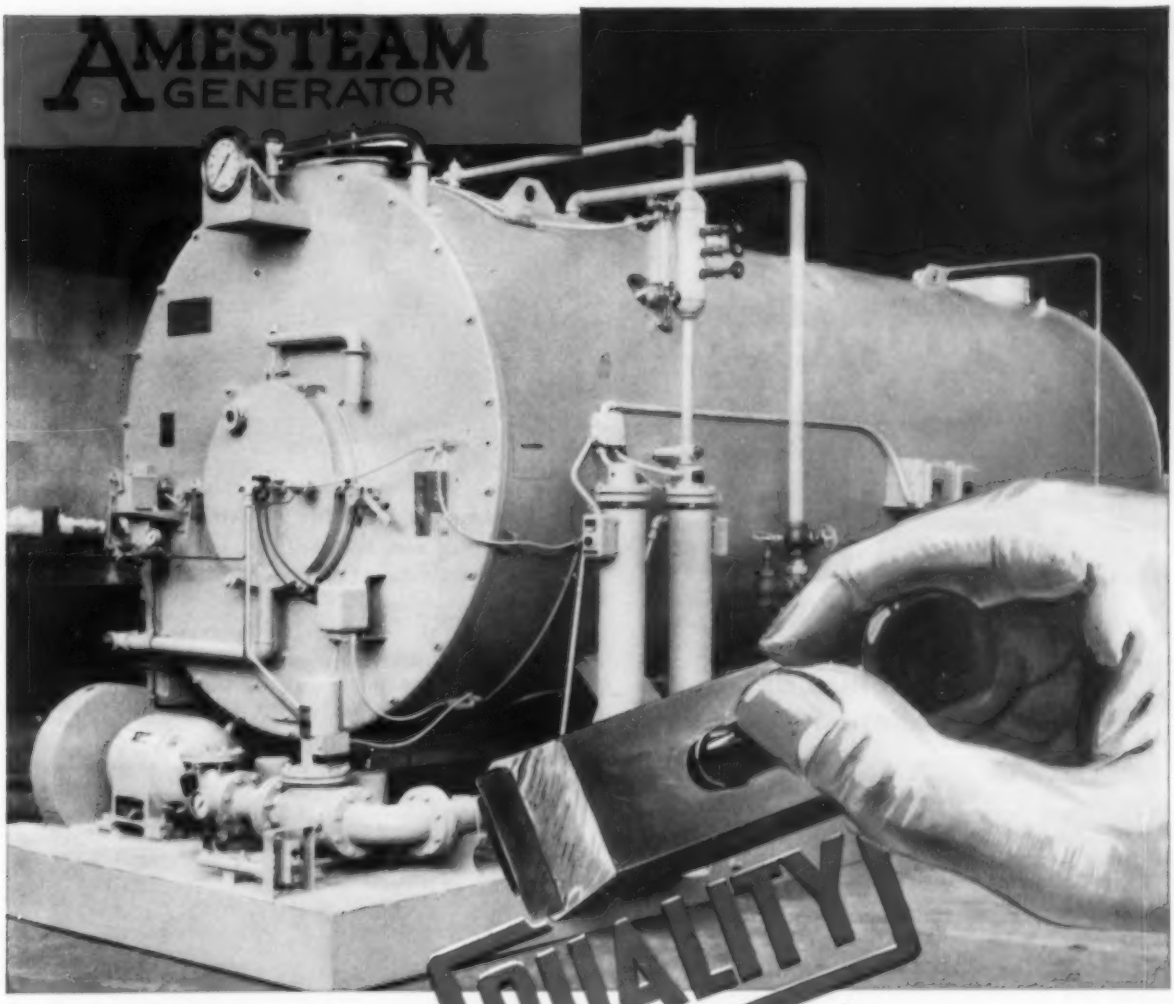
. . . with nontoxic, flexible contruction—*American Hard Rubber Co., Dept. HPAC, 93 Worth St., New York* 13.

Cited features are low cost, ease and speed of installation, permeance. Recommended by company for jet and submersible pumps, underground water distribution lines, industrial piping systems handling water or corrosive solutions at temperatures −50 to 125 F.

Electric Power Tool . . .

. . . with "automatic" torque control —*Ingersoll Rand Co., Dept. HPAC, 11 Broadway, New York* 4.

Utilizes "Torsion Bar" principle for control to run down fastenings to



It takes a Boiler to produce LOW COST STEAM

. . . and isn't low-cost steam what you're actually after in a boiler? There's only one way to get it — with a boiler of proven high quality.

Ames Iron Works has been building such boilers for 108 years, putting into them the engineering, material and workmanship necessary to give the best possible service to the customer.

Today's AMESTEAM GENERATOR, with its simple, efficient, 3-pass design, embodies the best of those 108 years — the latest developments which we know are practical. And the number of customers ordering their 2nd, 3rd, 4th, 5th and more AMESTEAM GENERATORS justifies the painstaking care that goes into these units.

For a quality boiler that's bound to give you overall steam economy — plus the well-known AMES 24-hour service — specify AMESTEAM GENERATOR — 20 sizes, 10 to 600 h. p. 15 to 200# Oil, Gas or Oil-Gas Combination . . . *Mail coupon today.*

AMES IRON WORKS INC.
BOX D-106 OSWEGO, N. Y.

AMES IRON WORKS
BOX D-106 OSWEGO, N. Y.

Gentlemen:

Please send me further information on AMESTEAM GENERATORS and name of the nearest representative.

NAME .....

COMPANY .....

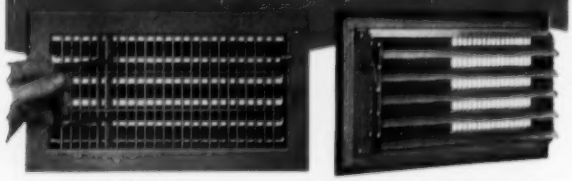
ADDRESS .....

You can get

DIRECTED AIR FLOW

at any angle with

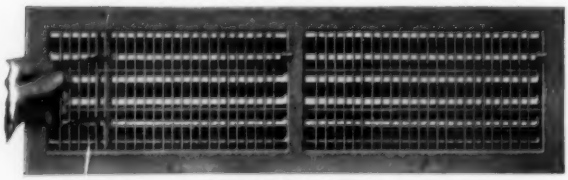
INDEPENDENT "Fabrikated" AIR CONDITIONING REGISTERS



321-A HMV

Rear View Showing "HMV" Valves

Every grille bar adjustable individually—before or after installation



321-A HMV Tandem

Any direction of air flow—right, left, up, down and any combination—is easily obtained with "Fabrikated" Style No. 321-A HMV air conditioning registers, for residence or commercial installations, on sidewalls or ceiling. The face bars are adjustable to right or left; valves on the back are adjustable to direct the air flow up or down; valves may also be fully closed, and are connected to open or close in unison.

The angles of deflection and the combinations to be had are practically unlimited. Adjustments for directed air flow may be made before or after installation. Grille bars are held firmly in place and will not vibrate or rattle.

"Fabrikated" registers are available in sizes from 8 x 4″ to 48 x 24″, including tandem style. Special sizes can be made without special die set-up charges.

Write for Catalog No. 56.

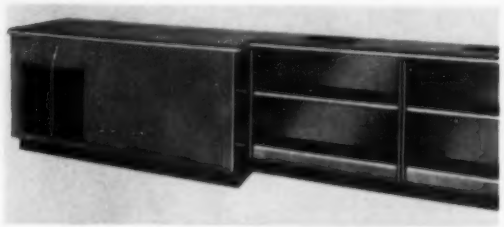
Always Leading—Always Progressing

THE INDEPENDENT REGISTER CO.

3747 E. 93rd STREET · CLEVELAND, OHIO

EQUIPMENT DEVELOPMENTS *Continued*

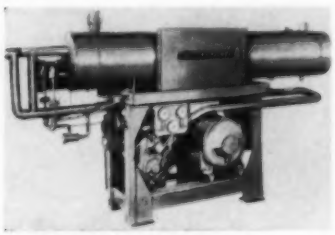
preset torque, shut itself off when preset torque is reached. Recommended by company for general industry, in assembly of metal products, in building and construction, or wherever nuts, bolts, studs, screws must be run to precise torques.



Perimeter Heating, Ventilating . . .

. . . system with bookshelf sections for schoolrooms—*Norman Products Co., Dept. HPAC,* 1150 *Chesapeake Ave., Columbus* 12.

Gas fired, forced air unit provides for individual heating of each room, says company, to eliminate need for separate building or extra space to house central heating plant. In 70,000, 85,000, 100,000 Btu input models.



Packaged Water Chillers . . .

. . . for air conditioning, industrial cooling applications—*American Blower Corp., Dept. HPAC, Detroit.*

In capacities 20 to 150 tons. Consist of base and framework, reciprocating type fluorinated hydrocarbon refrigerant (No. 22) compressor, direct expansion chiller section, heat exchangers, control panel, electric drive motor, and associated valves, strainers, gages. Across-the-line magnetic motor starters standard equipment. Cited feature is new copper tubing with star-shaped aluminum insert. Is said to more than double heat transfer surface, increase cooling capacity.

Swivel Joints . . .

. . . for military, industrial use—*Barco Mfg. Co., Dept. HPAC, Barrington, Ill.*

Engineered to provide safe, unlimited flexibility in piping or tubing lines in inflight equipment, track vehicles, other installations. In two types with "AN" flared or "ERMETO" ends in aluminum, steel, stainless steel for pressures to 4000 psi. Plane swivel joint permits 360 deg rotation in single fixed plane with

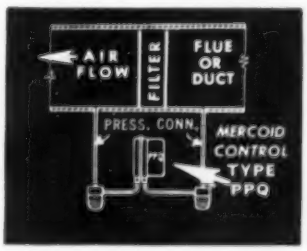
EXTREMELY
"Sensitive"
DIFFERENTIAL PRESSURE
Control
BY
MERCOID®

Has Hermetically Sealed Magnetic Mercury Switch

FOR AIR OR GAS (INCHES OR FRACTION OF INCHES OF WATER)

For low pressure or vacuum—to "make" or "break" electrical circuits on small changes in the difference between two pressures. Examples: to indicate a change in resistance through a filter (see illustration); to indicate a change in differential due to a change in air flow conditions; to indicate interruption of air flow.

This control incorporates two pressure chambers separated by a sensitive diaphragm. Each chamber is connected to a separate pressure source and the control is set to operate as the relationship of the two pressures change.



OPERATING RANGES—6" vacuum to 6" pressure (sensitivity .03") and 30" vacuum to 30" pressure (sensitivity .1" to .2").

CIRCUIT ARRANGEMENTS—several models available to accomplish the following operations:

SPST—USING ONE MAGNETIC SWITCH—open or close switch contact either on an increase or decrease of pressure difference.

SPST—USING TWO MAGNETIC SWITCHES FOR TWO STAGE OPERATION. Open/close both switch contacts on an increase in pressure difference.

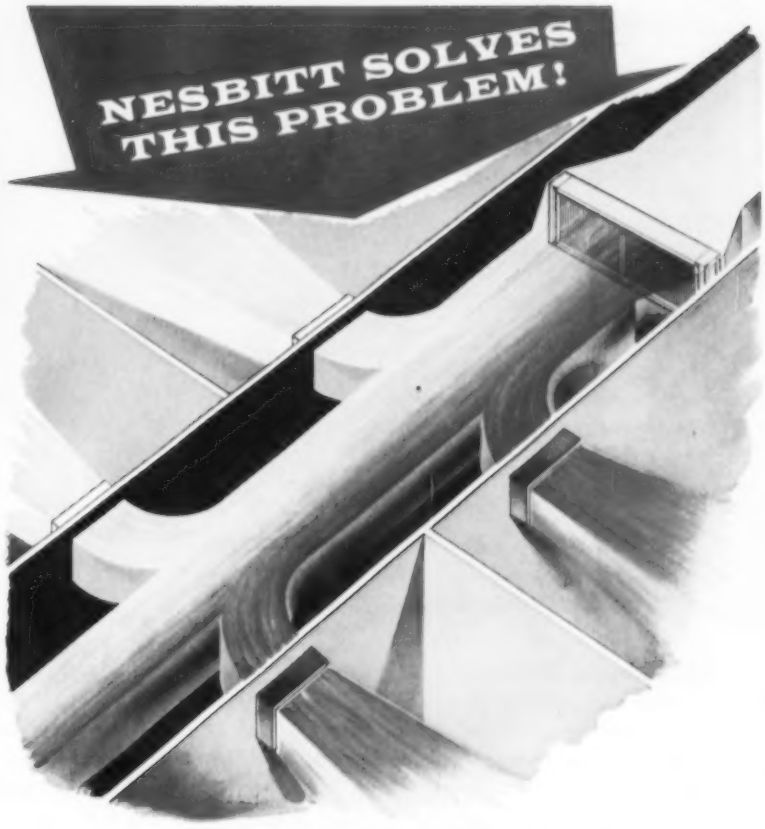
Open one contact on increasing pressure difference and one on decreasing pressure difference.

Close one contact on increasing pressure difference and one on decreasing pressure difference.

CASE STYLES—three types to meet following conditions: Indoor (general purpose), Outdoor (weather resistant), and Hazardous locations (explosion-proof).

WRITE FOR BULLETIN No. 14N

THE MERCOID CORPORATION
4211 Belmont Ave., Chicago 41, Ill.

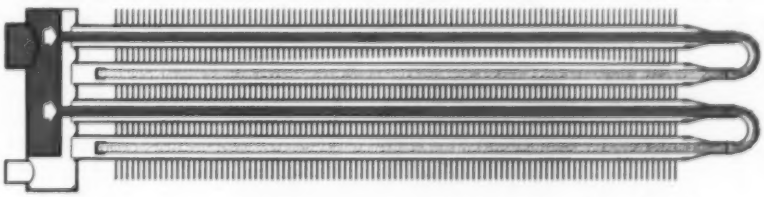


Nesbitt Series T Surface assures uniform discharge temperatures

If a coil will not deliver uniform temperature across its full length under modulated steam supply, you can expect uneven heating from the ducts. The only positive cure for this problem is to install Nesbitt Series T Surface with Trombone Steam Distributing Tubes.

Unlike conventional surface, Nesbitt Series T Surface employs the exclusive Trombone distributing tubes, each of which serves two adjacent condensing tubes from a single supply connection. Steam must travel across the first leg of the trombone tube (the full length of the surface) before reversing, under increased demand, to serve the second leg. Results: uniform discharge temperatures; maximum freeze protection; perfect controllability.

Nesbitt Series T Surface with Trombone Steam Distributing Tubes



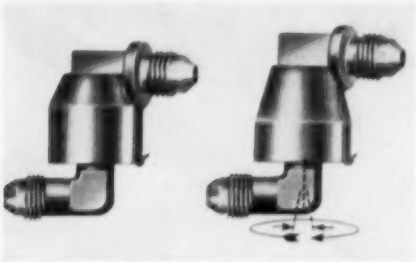
Nesbitt HEATING SURFACE

WITH THE TROMBONE STEAM DISTRIBUTING TUBES

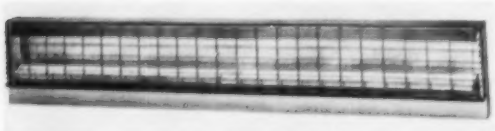
Made and sold by John J. Nesbitt, Inc., Phila. 36, Pa. Ask for Publication 305

EQUIPMENT DEVELOPMENTS

Continued



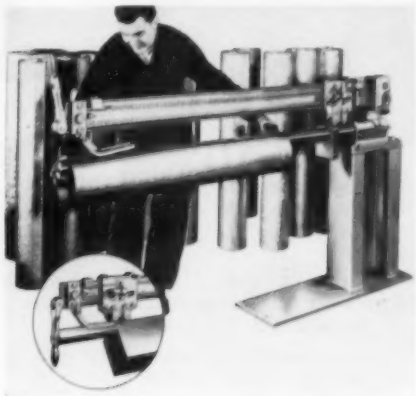
starting torque as low as 5 inch-pounds. Self-aligning unit has 360 deg rotation plus 15 deg total side flexibility to compensate for misalignment, minimize binding wear.



Baseboard Radiation . . .

. . . with high intensity silica glass radiant heat source —*Electriglas Corp., Dept. HPAC, Bergenfield, N.J.*

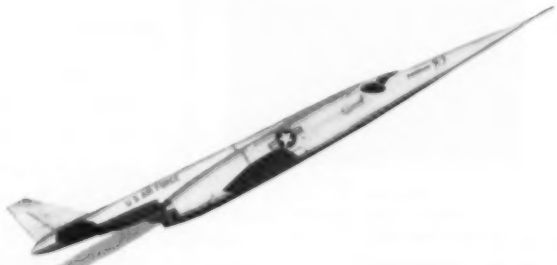
"Solar Glass" panels available in 600, 1000, 1500 watt sizes, measuring 30, 48, 72 in., respectively, in width. Designed for installation in any combination either completely recessed, semi-recessed or surface mounted. Wired for 120 or 240 volts.



Groover . . .

. . . with multipurpose horn for closing both single, Pittsburgh lock seams—*Niagara Machine & Tool Works, Dept. HPAC, 683 Northland Ave., Buffalo* 11.

Furnished as standard equipment, horn can be rotated, locked in any one of several positions for closing single lock seams on inside or outside of square and round work or Pittsburgh lock seams on square work. Driven by direct connected gearhead motor. Controls enable fast, smooth operation, says company.



ENGINEERING

—countless hours of engineering effort—is what made the X-3, Douglas Aircraft's sleek, new, supersonic research ship possible. Like the X-3, Western Engineering and Manufacturing's line of ventilators is the result of careful, skilled engineering.

Both have gone through several wind-tunnel-tested design stages, to ensure their superior performance under operational conditions.

Although engineering and performance data on the X-3 is classified and unavailable, complete engineering data on Western's line of ventilators can be obtained from your local jobber or by mailing to:

WESTERN ENGINEERING & MFG. CO.

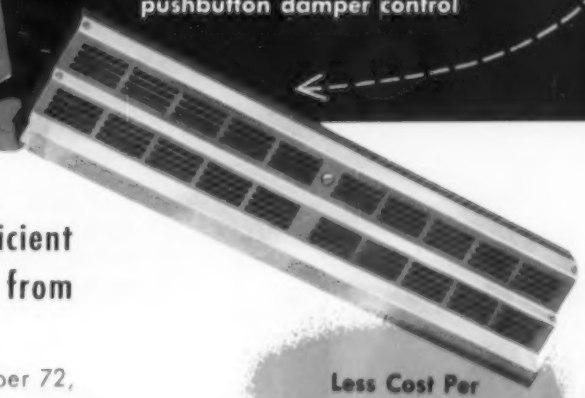
4114 GLENCOE AVE., VENICE, CALIF.

New!

LIMA SUPER 72

EXTENDED BASEBOARD DIFFUSER

with exclusive automatic pushbutton damper control



here's the answer to more efficient and economical air conditioning from extended baseboard outlets.

Any way you look at this new Lima Super 72, you'll find it ideal for cooling—as well as heating.

Compare it with any other baseboard diffuser. The greater free area and "throw power" of the Lima Super 72 is an important advantage in air conditioning with baseboard supply openings, where it is necessary to throw the heavy cold air up four to five feet above the floor to create proper air distribution and prevent cold floors.

TWO FOOT SIZE has 26.6 sq.in. of free area—enough for most residential requirements.
FOUR FOOT SIZE has twice the capacity—53.2 sq.in. of free area.

For stores, offices, schools, factories, churches and other large areas, Lima Super 72 Diffusers can be quickly connected in any multiples required, using the Lima Joining Connector.

And in any installation, Lima's quality construction features pay off by eliminating rattles or whistling at higher air velocities.

Write today for literature and specifications on the new Lima Super 72 Baseboard Diffusers and new Series 15 Grilles.

Less Cost Per Installation

Greater "Throw Power" For Heavy Cooled Air

Greater Free Area Per Foot of Length

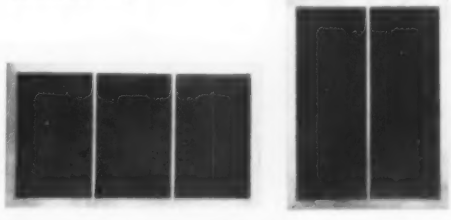
Lima

REGISTER COMPANY • LIMA, OHIO

sold exclusively through heating wholesalers and manufacturers.

New! Lima One-Piece Grilles

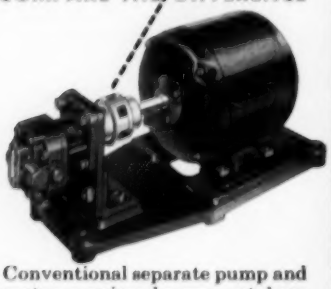
Lima beautifully styled horizontal and vertical grilles are now available in 113 sizes . . . quality-made from one piece of heavy gauge metal without welds. No mitered joints or loose construction.



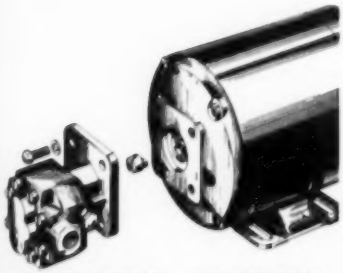
Easier Assembly, Less Bulk and Weight
No Shaft Alignment Problems
...with this close-coupled DOERR MOTOR

BARNES CONSTANT-FLO GEAR PUMP
with Special Doerr Motor

COMPARE THE DIFFERENCE



Conventional separate pump and motor requires heavy cast base plate, flexible coupling and pump support bracket. Special Doerr design, shown at top, reduced material costs and assembly time.



SIMPLIFIED ASSEMBLY

Permits easy inspection, quick replacement of motor or pump.

PRODUCT IMPROVEMENT PLUS MANUFACTURING ECONOMIES —The John S. Barnes Corp., Rockford, Ill., has achieved both with Doerr motors.

Barnes rotary gear pumps now feature a close-coupled Doerr design that links the motor directly to the pump. Result: a lighter, smaller combination that eliminates shaft alignment troubles, reduces vibration, cuts assembly time and costs.

Rated up to 3,000 psi, Barnes "pressure packages" employ NEMA 42, 56 and 66 frames ranging from ¼ to 1½ hp. These Doerr motors represent custom design at its best, backed by a reliable source of supply.

Why not put Doerr's long experience to work on your design problems? Consult Doerr for the economical answer to dependable power—engineered to fit your needs.

YOU GET MORE WITH DOERR

Electric motors from 1/30 to 5 hp.

DOERR
Electric Corporation
CEDARBURG 2, WISCONSIN

Standard or designed to your specifications

EQUIPMENT DEVELOPMENTS
Continued

Nonindicating Controllers . . .

. . . in two new models—*Wheelco Instruments Div., Barber-Colman Co., Dept. HPAC, Rockford, Ill.*

"150 Series" controller, shown, is potentiometer type unit designed for applications in batch process work. "Model 151 Amplitrol" is *on-off* controller for applications where transfer lag, dead time can be reduced to negligible value and simplest of control forms made usable.

End Caps . . .

. . . designed to prevent internal corrosion of stored pipe, tubing—*Protokap, Inc., Dept. HPAC, 625 West Bldg., Houston.*

Neoprene slip-over, roll-on caps are said to seal out air, moisture, corrosive fumes, dust, small animals. Two types available: lightweight, roll-on unit for pipe 2 to 10 in. diameter; heavier, slip-on type for 2 to 20 in. diameter. Slip-on covers have ⅛ in. wall thickness.

Convector-Radiator . . .

. . . for "continuous" installation—*Fedders-Quigan Corp., Dept. HPAC, Lalor and Hancock Sts., Trenton, N.J.*

Is said to deliver even, reliable heat to 3930 Btu per lineal ft. De-

in a hurry to get stainless steel pipe?

CALL YOUR REPUBLIC ELECTRUNITE DISTRIBUTOR

He'll ship the sizes you need, in the analyses the job calls for. And he'll deliver your order with all possible speed.

You'll be able to tell at a glance it's Republic ELECTRUNITE® Stainless Steel Pipe or Tubing, too. Every length is clearly stenciled for positive identification before use—and even after it's cut.

You can get ELECTRUNITE Stainless Steel Pipe in types 304, 304-L, 316, 316-L, 321 and 347 along with other analyses. Continuous weld sizes are available from ⅛″ I.P.S. through 2″ I.P.S. in A.S.A. schedule 40S; from ⅛″ I.P.S. through 4″ I.P.S. in schedule 10S; and from ½″ I.P.S. through 4″ I.P.S. in schedule 5S wall thicknesses. Larger sizes up to 30″ also available. Republic Stainless Steel Tubing also comes in a complete range of sizes and analyses.

And remember, it doesn't matter how the pipe or tubing have to be joined. Republic ELECTRUNITE Stainless Pipe and Tubing can be welded, threaded or used with compression fittings.

So when you're in a hurry for stainless pipe or tubing—relax. Simply pick up the phone and call your nearest Republic ELECTRUNITE Distributor (see list). He's a man you'll enjoy doing business with. Over and over again.

REPUBLIC STEEL CORPORATION
STEEL AND TUBES DIVISION

ALABAMA
Industrial Piping Supply Co., Bessemer

CALIFORNIA
Ducommun Metals and Supply Co., Los Angeles
Earle M. Jorgensen Co., Oakland

CONNECTICUT
Peter A. Frasse and Co., Inc., Hartford

GEORGIA
Atlantic Steel Company, Atlanta

ILLINOIS
Chicago Steel Service Co., Chicago
Chicago Tube and Iron Co., Chicago
Creamery Package Co., Chicago

KENTUCKY
Williams and Company, Inc., Louisville

MARYLAND
Hill-Chase Steel Co. of Maryland, Baltimore

MASSACHUSETTS
Springfield Plumbing Supply Co., Springfield

MICHIGAN
Kenneth Anderson Company, Detroit

MISSOURI
Marsh Steel Corp., North Kansas City

NEW JERSEY
A. B. Murray Co., Inc., Elizabeth

NEW YORK
W. A. Case & Son Co., Inc., Buffalo
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TENNESSEE
Metals, Inc., Bristol
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TEXAS
The Baldwin Co., Houston

VIRGINIA
John Frishchkorn, Richmond
Mize Supply Co., Waynesboro

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World's Widest Range of Standard Steels and Steel Products

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Steel and Tubes Division
228 East 131st Street, Cleveland 8, Ohio

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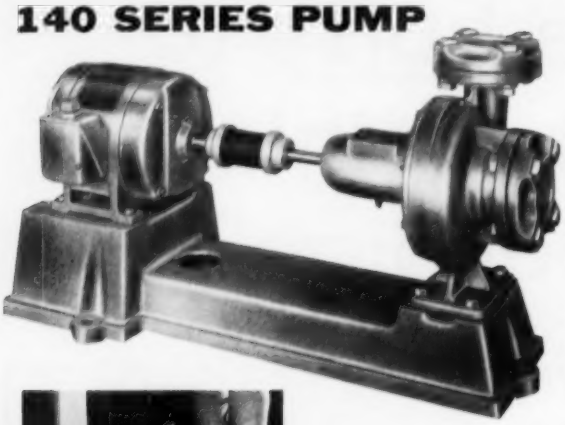
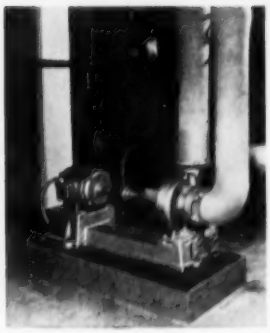
C-1896

NEW FROM TACO
140 SERIES PUMP





For quiet, vibrationless operation and rugged dependability on large installations

Designed specifically for heating and cooling systems requiring quiet, smooth operation, the new Taco No. 140 series pump offers a host of outstanding features:

- Water-tight, self-adjusting, self-lubricated mechanical seals.
- A motor selected for quiet operation, equipped with oil lubricated, bronze sleeve bearings.
- A spring drive coupling which easily absorbs starting torque and designed for quiet operation.
- A long-life impeller shaft of stainless steel, hardened and ground to a mirror finish.
- Bronze bearings in bracket, separated by a thrust collar attached to the shaft, absorb all end thrust.
- An oil bath circulating system with modern slinger rings, lifts oil to both bronze bearings.
- Bearing bracket, impeller and shaft are completely removable without disturbing motor, volute or piping connections.
- A closed type impeller of bronze or cast iron, dynamically balanced for smooth noiseless operation and designed to eliminate hydraulic thrust.
- Volute on body legs bolted directly to the base prevent piping strains from changing pump alignment.
- A base of cast iron designed with a three-point floor mounting to simplify leveling. Provision is also made to fill with concrete for sound deadening.

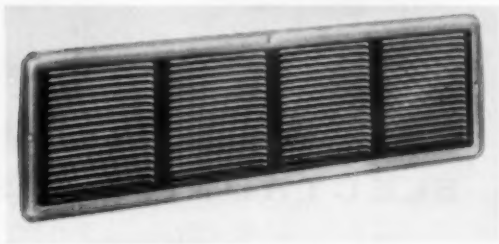
For the features that mean a better performance for every large hot water heating or cooling system, put the new Taco No. 140 series pump on the job!

Better Heating — Taco — Better with Taco

TACO HEATERS, INCORPORATED
1160 Cranston St., Cranston 9, R. I.

EQUIPMENT DEVELOPMENTS — *Continued*

signed to do long walls with minimum of piping, connections. Specifications include: element tubes which are expanded to fit over adjoining sections for sweat connections; ribbed aluminum fins, spaced by die-formed collars to increase metal-to-metal contact between fin and tubes; interlocking fronts for adjacent sections designed to present smooth assembled appearance without necessity of joining strips.



Return Air Grilles . . .

. . . for air conditioning—*Air Control Products, Inc., Dept. HPAC, Coopersville, Mich.*

In types "21-H" for sidewall installation, "23-H" for baseboard applications. Units differ from company's standard models in that fins run horizontally. Arrangement is said to facilitate better appearance on certain installations. In two sizes, 24 × 6 in., 30 × 6 in.

Valve Warmer . . .

. . . engineered to maintain temperature for needed flow—*Dean Thermo-Panel Coil Div., Dean Products, Inc., Dept. HPAC,* 616 *Franklin Ave., Brooklyn* 38.

Clamp-on type unit applicable to wide range of valve designs, says company, in 4 to 10 in. sizes. Made of two sheets of metal welded together, with outside sheet embossed to create flow channels. Shown above are (*left*) view of valve top showing how warmer is clamped in place; and (*right*) view of bottom of valve and warmer in place.

Block Steel Valve . . .

. . . for hydraulic and air service to 10,000 psig, steam service to 2500 psig, ammonia service to 5000 psig—*Strong, Carlisle & Hammond, Dept. HPAC,* 1392 *W. Third St., Cleveland* 13.

New! VULCAN LINO-TRIM
COMMERCIAL ENCLOSURE

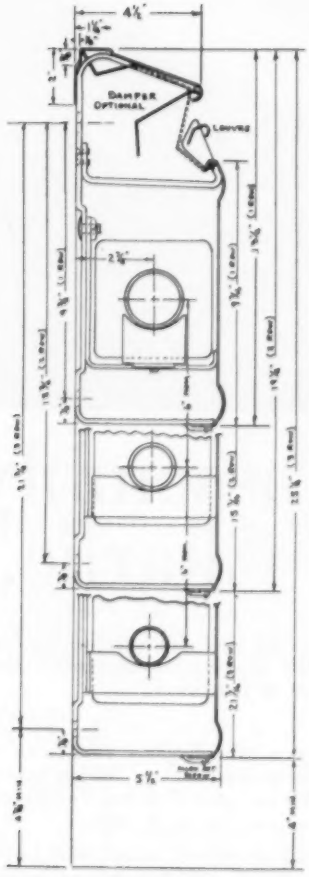
STYLED FOR BEAUTY
DESIGNED FOR HIGH OUTPUT

APPLICATIONS

The perfect choice for modern architecture, including schools, hospitals, churches and office buildings.

FEATURES AND ADVANTAGES

- Design simulates Vulcan's famous TRIMLINE Baseboard, particularly suited to modern and progressive architecture.
- Designed for high output, wide flexibility. Available in 1-, 2- and 3-high.
- Front easily removed for cleaning and access to piping. Top permanently anchored to wall with pre-formed caulking groove to prevent air leakage — eliminates periodic removal and subsequent damage to wall finish.
- Attractive, fixed louvre.
- Enclosure can be easily cut to length on the job.
- Permanently anchored, extra heavy steel support brackets hold cover rigidly, top and bottom.
- Full line of matching accessories.



Note: Available with Rigid or Slide Cradle Hangers. The same enclosure can be used with 3¼" and 4¼" fins.

SPECIFICATIONS

LENGTHS — Available in stock lengths up to 8′ in 6″ increments.

DAMPERS — furnished in same length as enclosures; packed separately and easily installed in field without screws. Snaps into place.

MATERIAL — 18 gage, zinc-coated, rust-resistant, bonderized steel. (16 gage also available.)

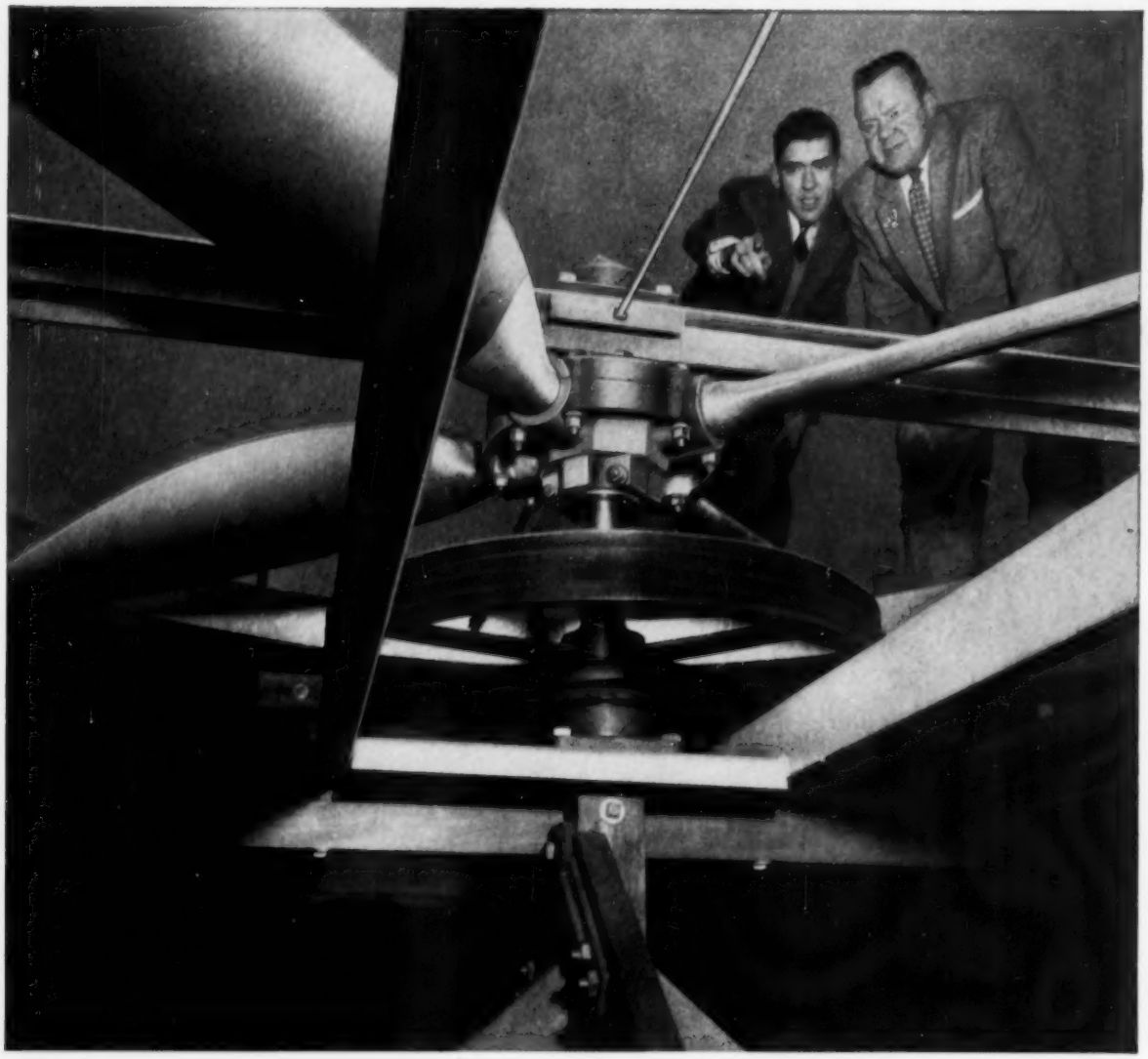
RATINGS

Complete ratings available. Write today for Catalog 625B.

THE VULCAN RADIATOR CO.

775 CAPITOL AVE., HARTFORD 6, CONN.

Originators of Fin-Tube and Baseboard Radiation in America



"Take a look at the fan assembly on this LoLine Tower, Charlie."

"Looks rugged, doesn't it?"

"And it is. Yet the design is simple. About all there is to it is that heavy-duty fan wheel; those over-size bearings, the multi-V belt drive and that galvanized fan stack."

"Where's the motor?"

"Outside of the hot, moist air stream. No corrosion that way. Pritchard doesn't give rust a chance on the LoLine. Notice that the structural members supporting the fan assembly are hot-dip galvanized."

"But how about the fan shaft? Is it protected, too?"

"Stainless steel! And it has self-aligning bearings. See how those snap rings are used for positioning bearings! Speaking of the bearings — you grease these bearings from *outside* of the tower."

"Outside!"

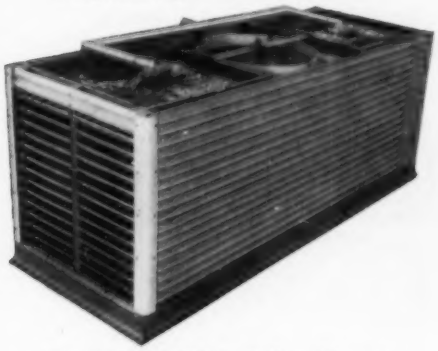
"Yes, see those copper tubes? They run from the grease fittings outside to the bearings. Makes lubrication much easier and a lot safer. Pritchard also makes available a speed reducer drive, if desired."

"No wonder you were so excited about this LoLine tower. Pritchard sure did go out of their way to make it a good one didn't they?"

J. F. PRITCHARD & CO. OF CALIFORNIA
4625 Roanoke Parkway, Kansas City 12, Mo.

"Take a look at the fan assembly on this LoLine tower, Charlie."

Pritchard LOLINE® Is Lowest Silhouette Tower of 75 Tons Capacity and Up!



The Pritchard LoLine Cooling Tower is the lowest (7' 7 11/16" over-all) tower of 75 tons capacity and up now available. The LoLine incorporates many features in its design which are unique in low silhouette tower construction:

1. Galvanized steel fan drive supports and basin accessories.
2. Grease fittings for bearings on V-belt drive are outside tower.
3. Corrugated asbestos cement board casing.
4. Asbestos cement board louvers are standard, not special equipment.
5. Internal pipe supply system. Piping is completely concealed. (Optional.)
6. V-belt drive has stainless steel fan shaft.

GET ALL THE FACTS!

Write today on your company letterhead for your copy of the LoLine Bulletin 5.1.902. It gives complete details on this new, low silhouette tower. No cost or obligation, of course.

INDUSTRY'S PARTNER FOR PROGRESS

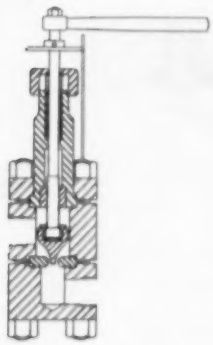
J.F. Pritchard & Co.
OF CALIFORNIA
A DIVISION OF J. F. PRITCHARD & CO.

Dept. 473, 4625 Roanoke Parkway
Kansas City 12, Mo.

COOLING TOWERS • GAS & AIR TREATING EQUIPMENT
REPRESENTATIVES IN PRINCIPAL CITIES FROM COAST TO COAST

EQUIPMENT DEVELOPMENTS

Continued

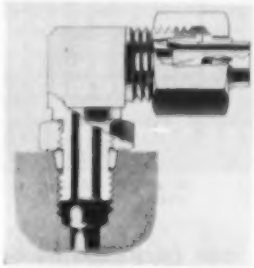


Designed for high temperature, high pressures, continual throttling. In inside or outside screw models. Cited feature is bolted-in seat construction. In 3/8, 1/2, 3/4, 1 in. sizes.

Pumps . . .

. . . with 15, 30 gal horizontal tanks —*Lancaster Pump and Mfg. Co., Dept. HPAC, Lancaster, Pa.*

In shallow and deep well, 1/3 and 1/2 hp models. Cited feature is four volute self priming design.



O-Ring Fitting . . .

. . . in all styles, sizes 1/8 to 2 in.— *Flodar Corp., Dept. HPAC,* 16911 *St. Clair Ave., Cleveland* 10.

Unit is said to be leakproof, provide safe high pressure connections, be very easy to position. Meets SAE and JIC standards, says company.

COOLING WITH STEAM

C. H. WHEELER STEAM JET EJECTORS

In most cases if a process steam system is large enough for heating in winter, it can be used economically to provide air conditioning in the summer, because the increased steam load costs less per pound than the part load for process alone. A C. H. Wheeler Steam Jet Ejector system becomes most economical when air conditioning requirements exceed 100 tons. By means of this system water is chilled to as low as 50-55°F. with steam pressure of 50 psi or over. C. H. Wheeler has always led in the development of the steam jet ejector and its application to industrial refrigerating requirements. We invite your correspondence.

(Catalog 1462 is available.)

Note: In many areas utilities offer an attractive street steam rate in summer, which makes the steam jet ejector system economical for air conditioning large commercial and public buildings.

WE-509

C.H. Wheeler of Philadelphia
19TH AND LEHIGH AVE., PHILADELPHIA 32, PA.

EQUIPMENT DEVELOPMENTS *Continued*

Oil Coolers . . .

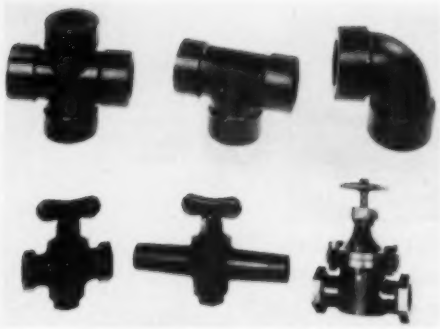
. . . for application on air compressors, machine shop coolant systems, diesel and gasoline engines, hydraulic equipment—*Heat-X, Inc., Dept. HPAC, Brewster, N.Y.*

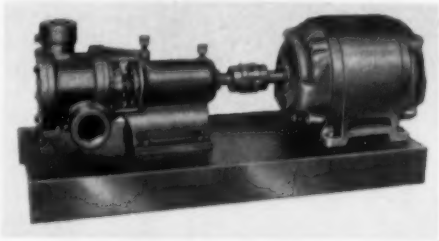
Cited feature is inner-fin construction, said to permit more cooling in less space. "WIO" units are of nonferrous construction, with brass shell and copper tubes. For operating pressures to 250 psi, operating temperatures to 300 F.

Plastic Pipe, Fittings, Valves . . .

. . . available in unplasticized polyvinyl chloride, "Styrene-Copolymer," "Buna N" materials—*Vanton Pump & Equipment Corp., Dept. HPAC,* 201 *Sweetland Ave., Hillside, N.J.*

To be marketed by company as "P," "S," "N" lines, respectively. Pipe, fittings range in size ⅛ to 6 in. In addition to standard globe, angle, Y valves in "N" line, plug cocks, straightway cocks, bib cocks, check valves, float valves, foot valves also offered in sizes to 4 in.



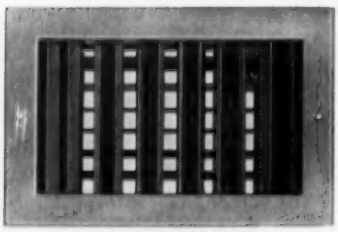


Process Pumps . . .

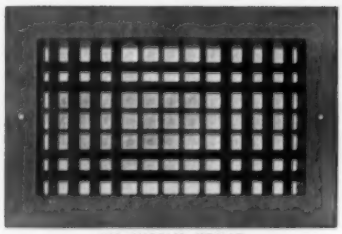
. . . for handling liquefied petroleum gases, refrigerants, other light nonviscous liquids—*Aurora Pump Div.,*

Need Faster Delivery Service to Meet Production Schedules?
. . . Air Diffusion Equipment for Exacting Requirements?
. . . Complete Selection, Offering Performance and Beauty?

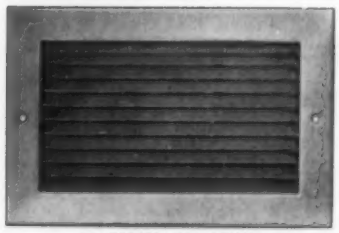
WATERLOO has the answer



2VO SUPPLY REGISTER
4-Way adjustable deflection
with opposed blade damper



2V SUPPLY GRILLE
4-Way adjustable
deflection



3H RETURN AIR GRILLE
Fins fixed at
45° deflection

Waterloo
AIR DIFFUSION EQUIPMENT

"Since 1902"
Write for Complete Catalog or Name of your Local Waterloo Representative

our facilities have been increased to give you still better SERVICE

Now recognized for unusual delivery service within the industry, Waterloo's plant facilities have again been increased to assure our maintaining this enviable reputation. In an emergency we can expedite your order quickly, without disrupting a diversified production schedule.

Leading architects, engineers and contractors constantly specify Waterloo for the finest
- Schools
- Hospitals
- Churches
- Government Buildings
- Industrial Buildings
- Office Buildings
- Other Commercial Structures

WATERLOO REGISTER CO., Inc.
P. O. BOX 72 WATERLOO, IOWA, U. S. A.

Mark of Integrity

...in reporting circulation facts

We display the Audit Bureau of Circulations* symbol with pride! It's our mark of circulation integrity!

The seasoned marketing man finds trustworthy data vital in his work of advertising media evaluation. And *reliable net paid circulation figures* are among the most valuable facts he uses in selecting printed media for his advertising campaigns.

Once every advertiser guessed about circulation accuracy and gambled on advertising results; today he need not question the wealth of data in any A.B.C. audit report, for it contains only *verified* answers to his most searching circulation queries.

* * *

*The Audit Bureau of Circulations, founded in 1914, is a cooperative, nonprofit association of the leading buyers and sellers of advertising space. A.B.C. sets standards for net paid circulation, audits and reports circulation facts. **To be sure of what your print media dollar buys—look for the A.B.C. symbol.***

When a media director or advertiser asks us, "How much paid circulation? What do your readers pay? Where does your circulation go? How do you get circulation—your audience for my advertising?", we need only show him our latest A.B.C. audit report. There he finds factual answers that annually pass the test of a trained A.B.C. circulation auditor's scrutiny.

And any buyer of space can decide for himself, with confidence, the value of our circulation audience. Our A.B.C. membership means circulation reported in accordance with recognized, impartial standards, established by buyers and sellers of space working together in A.B.C.

Publishers who meet the Bureau's high standards know the A.B.C. symbol as a mark of circulation integrity. The value-wise advertiser, too, has learned that *the A.B.C. symbol is his dependable guide to the audited facts* about net paid circulation that protect his advertising investments.

Heating, Piping & Air Conditioning

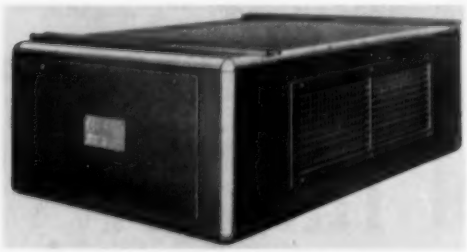
MEASURE OF SERVICE...MARK OF INTEGRITY

EQUIPMENT DEVELOPMENTS

Continued

New York Air Brake Co., Dept. HPAC, Aurora, Ill.

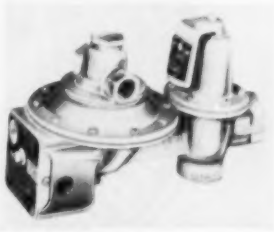
Series "APCO-ZA" turbine type, single and double stage units available in any machinable alloy such as nickel, Monel, stainless steel, says company. Low suction head requirements are said to assure positive, non-pulsating flow. Has no shaft leakage because minimum pressure is exerted against mechanical seal through use of built-in pressure relief, manufacturer adds.



Air Conditioning System . . .

. . . for remote, ceiling mounted installation in stores, offices, hotels, motels, institutions—*Circle-Air Industries, Dept. HPAC, 244 Herkimer St., Brooklyn* 16.

Year 'round unit uses same piping circuit now used for heating to cool in summer, heat in winter, ventilate in off seasons. Can be used in fireproof buildings, since in most installations ducts are not needed, says company. In 20 different models, range of capacities, for either free blow or duct installation in irregular areas.



Valve . . .

. . . engineered to provide "complete" protection for hot water boilers from single unit—*Bell & Gossett Co., Dept. HPAC, Morton Grove, Ill.*

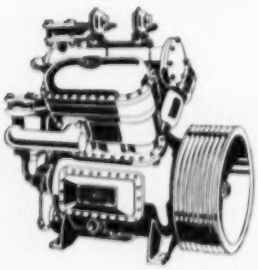
"No. 190 System Saver" combines ASME pressure relief valve rated 190,000 Btu per hr, "automatic" pressure reducing valve, safety high limit cutoff switch, new emergency feed device, says company. Recommended by company for hot water boilers to 190,000 Btu per hr.

Air Conditioner . . .

. . . with explosion resistant, packaged design for installation in hazardous areas—*Conditioned Air, Inc.,*

FRICK TRADE MARK®

Air Conditioning Serves Throughout this Unique Hotel



Nine Frick "ECLIPSE" Compressors Air-Condition the Claypool Hotel at Indianapolis

Famed as the first COMPLETELY air-conditioned large hotel north of the Mason-Dixon Line, the Claypool at Indianapolis selected Frick equipment because it had used Frick Refrigeration for food service since 1939.

Nine Frick "ECLIPSE" compressors, installed by Decker and Roberts of Fort Worth, carry the air conditioning load, which is divided into three systems.

You get the utmost in air conditioning, ice making, quick freezing and cooling services when you specify "Frick." Let us quote now on your commercial or industrial cooling needs.

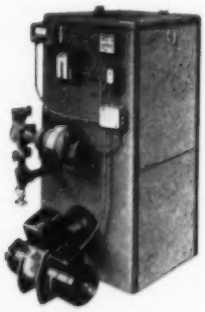
FRICK COMPANY • WAYNESBORO, PENNA.

Get Handshakes Not Headaches... ...

Install ALL-BURNHAM HEATING!

Eliminate costly call-backs at the start. Install Burnham Boilers and BASE-RAY® and watch your profits go up. Your customers will shake your hand, thank you . . . and recommend you to their friends. The reason is simple. For generations Burnham has meant hot water heating at its comfortable, economical and dependable best . . . equipment that's quality-made of lifetime cast iron.

BASE-RAY Cast-Iron Radiant Baseboard gives the ultimate in beautiful interiors and draft-free, even heat. No expansion noises. It's hot water heating at its best. Proven Series-Loop System gives amazing savings in labor and material, too! Available in 2 sizes – No. 7 and No. 9.

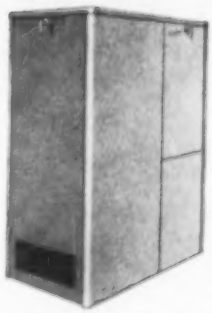


PACE-PAK® — Oil

A preassembled packaged boiler – factory wired, equipped and tested.

HOLIDAY — Gas

An advanced design that brings new economy to gas heating. Also packaged as HOLIDAY-PAK.



PACEMAKER® — Oil

A popular oil boiler because it's a fuel miser even under heavy loads.

TANKLESS HOT WATER HEATERS

These 3 Burnham Boilers can easily be equipped with specially designed all-copper coils for automatic year 'round domestic hot water.

Burnham Corporation

FIRST IN THE MANUFACTURE OF BASEBOARD HEATING

IRVINGTON, NEW YORK

MEMBER OF THE BETTER HEATING—COOLING COUNCIL

MAIL COUPON TODAY FOR FULL DATA

Burnham Corporation HP-106
Irvington, New York

Please send illustrated folders giving full data on:
☐ BASE-RAY ☐ PACE-PAK ☐ HOLIDAY ☐ PACEMAKER

Name .....

Address .....

City ..... State .....

R-P&C's complete line of Cast Steel Valves and Fittings

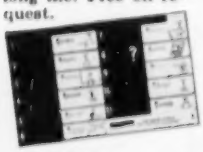
—SIZES UP TO 24"

—PRESSURE CLASSES FROM 150 TO 2500 LBS.

• R-P&C's valve line includes a complete selection of cast steel valves and fittings. These are manufactured in all standard valve steels in a complete range of sizes, pressure classes, and styles.

• Included are gates, globes and angles, swing and lift checks, in a wide range of constructions, and all classes of flanged fittings. Pressure sealed designs for high temperatures and pressures, automatic stop and check valves, and many other special purpose valves and fittings complete the line.

FREE WALL CHART
"How to Protect Your Valves"
17" x 11" wall chart gives installation and operation pointers to protect valves, prolong life. Free on request.



• All R-P&C steel valves and fittings conform to the exacting standards of design and manufacture that users have learned to expect from R-P&C. And all are providing, in many different applications, the dependability that is the R-P&C standard.

See your R-P&C distributor or write for R-P&C's convenient catalog

ACCO

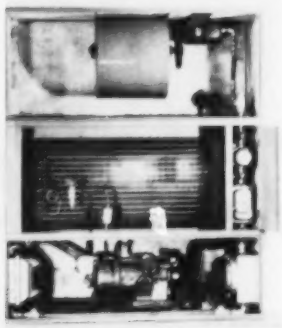
R-P&C Valve Division
AMERICAN CHAIN & CABLE

Reading, Pa., Atlanta, Boston, Chicago, Denver, Detroit, Houston, New York, Philadelphia, Pittsburgh, San Francisco, Bridgeport, Conn.

R-P&C valves

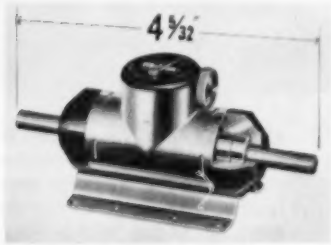
EQUIPMENT DEVELOPMENTS

Continued



Dept. HPAC, P.O. Box 2429, Charleston 29, W. Va.

Recommended by company for use in chemical, petrochemical, petroleum, mining industries. In 3, 5 ½, 7 ½ ton sizes. Suitable for installation in class I, group D areas.



Ratio Speed Changer . . .

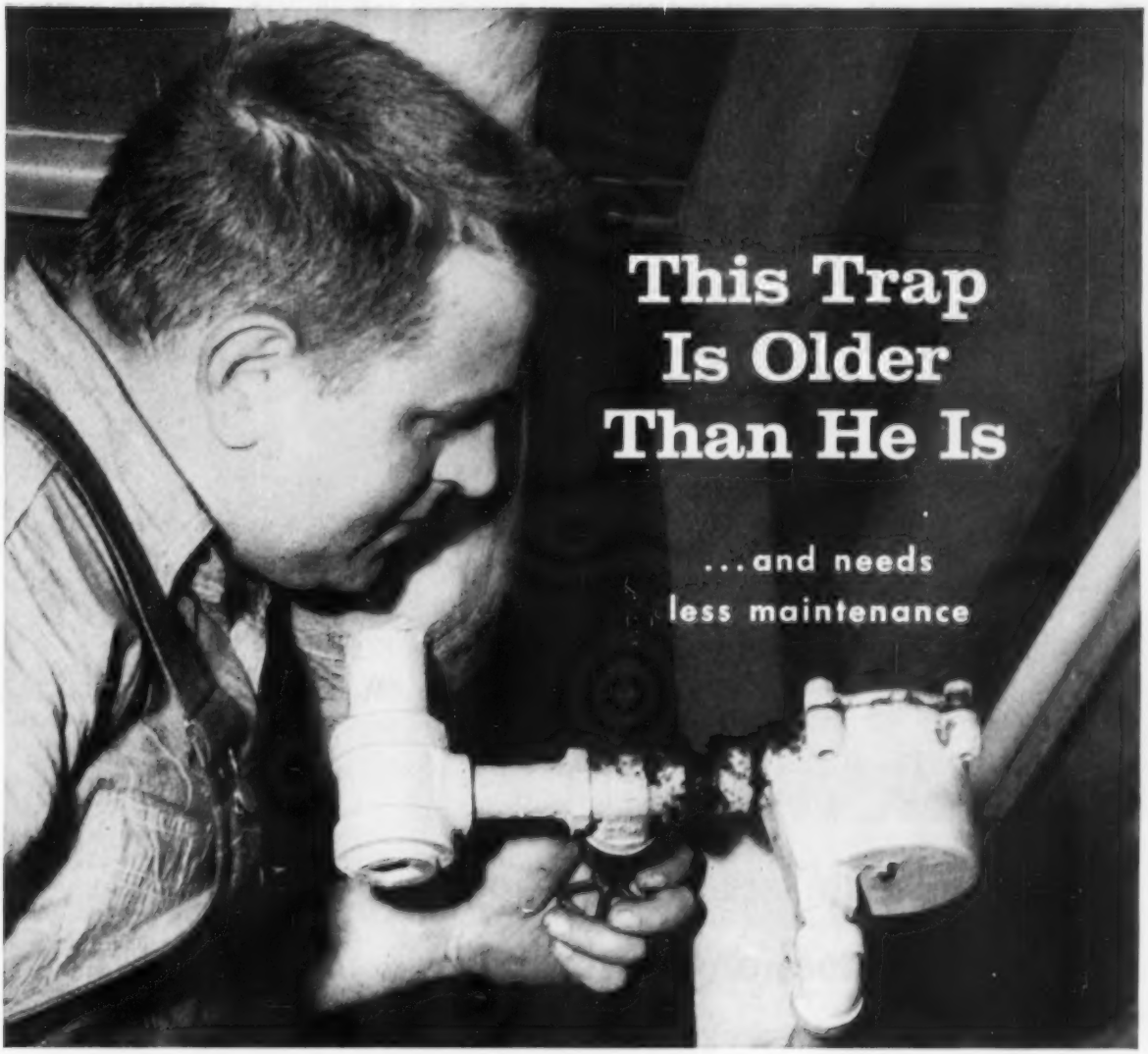
. . . with anodized aluminum end bells with two pressed fit ball bearings for each shaft—*Metron Instrument Co., Dept. HPAC, 432 Lincoln St., Denver 3.*

Concentricity between input, output shafts held closer, says company, resulting in very smooth operation. Metal construction is said to give increased resistance to impact, vibration. Delivers 0.025 hp and 5 to 40 ounce-inches torque, depending on ratio setting. Speeds to 10,000 rpm on either shaft permissible. Ratio of input to output speed infinitely adjustable between 1 to 5 up, 5 to 1 down—total range of 25 to 1.

Pneumatic Controller . . .

. . . designed for high stability of control action without loss of sensitivity —*Bristol Co., Dept. HPAC, Waterbury, Conn.*

Cited feature is wide proportional band. Recommended by company for



Operating Engineer Claude Rogers is inspecting an old trap that was installed in the LaSalle Hotel, Chicago, in 1909—before he was born! That's 47 years of service, and it's still operating. It's one of 62 old Illinois Engineering "Automatic Float-type Vacuum" traps still doing a job there.

Some of the traps were replaced in 1952, after 43 years of duty. But—mark this—*the LaSalle always replaces the original traps with new Illinois Float and Thermostatic Traps.* And the LaSalle's new heating-air conditioning system has *only Illinois* traps.

Reasons: More years of trouble-free service than you'd ever expect . . . No maintenance problems with Illinois' simple, solid design . . . probably the most efficient system of condensate drainage yet devised for heating systems . . . Straight-through connections to save head room and labor.

For real *durability* and efficiency in a Float and Thermostatic trap, take a hint from the LaSalle Hotel's 47-year-old Illinois installation and hundreds more like it. Specify Illinois Series G Float and Thermostatic traps for low and medium pressure steam jobs from 15 lbs. pressure to 25 inches vacuum. Series MG to 50 lbs. pressure. Available in sizes from ¾" to 2". Send for Bulletin 251 *now.*

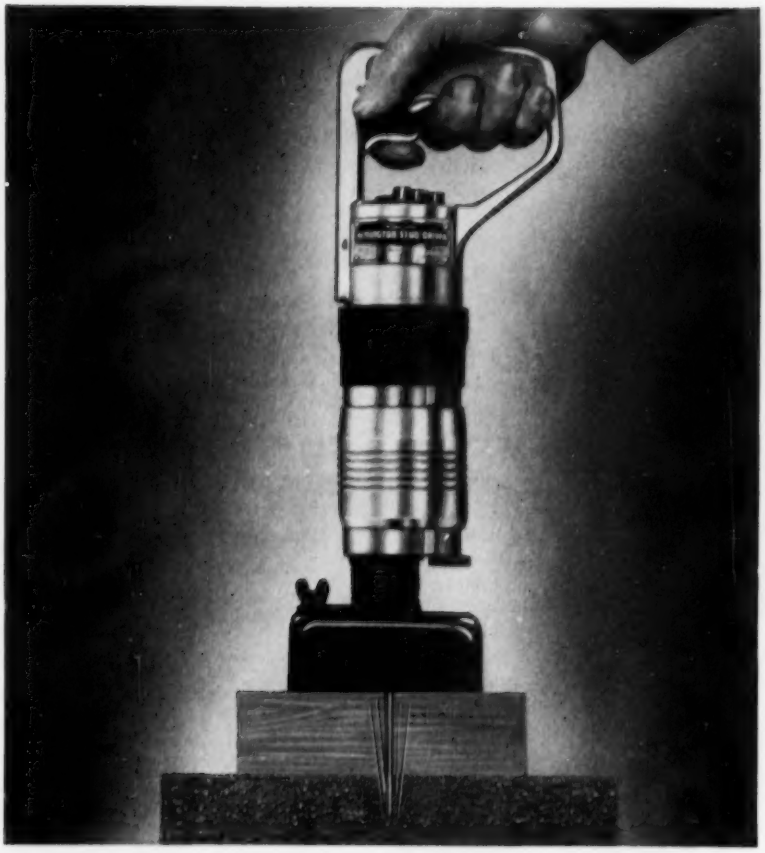
illinois
ENGINEERING

Illinois Engineering Company

2027 S. Racine Ave., Chicago 8, Ill.

DIVISION OF AMERICAN AIR FILTER COMPANY, INC.

Heating Specialties • Power Specialties • Control Systems



Just a squeeze sets the fastening stud in steel or concrete!

THAT'S HOW SIMPLE IT IS—a flex of the finger—to anchor fixtures securely with the Remington Stud Driver. Off goes the power load, the stud is anchored into steel or concrete—straight as an arrow. No predrilling or outside power source required!

You can set both ¼" and ⅜" diameter studs with the Remington Stud Driver—up to 6 studs per minute either size. There are 40 different styles and lengths of Remington Studs to choose from. With this *one* tool, you can take on *every* stud-fastening job—light, medium and heavy-duty—and save time and money on every one of them! Get full details by mailing coupon below.

Remington

DUPONT

STUD DRIVER

Industrial Sales Division HPAC-10
Remington Arms Company, Inc.
Bridgeport 2, Conn.

Please send me your free booklet which shows how I can speed my job and save with the Remington Stud Driver.

*Name*_____ *Position*_____

*Firm*_____

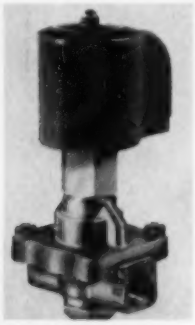
*Address*_____

*City*_____ *State*_____

EQUIPMENT DEVELOPMENTS

Continued

measuring, controlling such variables as pressure, vacuum, temperature, liquid level, flow, differential pressure, mechanical motion. Control modes available include narrow band (on-off), proportional, reset, derivative, reset plus derivative.



Solenoid Valve . . .

. . . for high pressure, heavy fuel oil, pilot operated service—*Automatic Switch Co., Dept. HPAC, 391 Lakeside Ave., Orange, N.J.*

Packless, two-way bronze body unit has ¾ in. port, and 15 to 300 psi pressure range. Designed to handle heavy fuels to 200 F. Normally closed unit has following cited features: tight shutoff; positive operation; built-in strainer; simplified inspection and cleaning; low pressure drop.

Packaged Heat Pump . . .

. . . in sizes 2 to 10 hp—*WeatherKing of Florida, Inc., Dept. HPAC, Orlando, Fla.*

Cited features include: "Aqua-Air" jet, designed to provide maximum efficiency of condenser-chiller during heating operation; improved four-

B.F.Goodrich

How Cell-Tite® solves 2 miles of condensation problems

Supplied in 50 foot rolls, tubing can be custom cut for the job, eliminating waste and reducing costs.

Flexible Cell-Tite tubing is ideal for short, sharp curves of copper tubing. Except for modernizing existing installations, piecing or gluing is unnecessary.

AFTER a recent air conditioning installation that required over 11,000 feet of Spongex Cell-Tite tubing, Mr. Charles Ross, President, Economy Plumbing & Heating Co., Chicago, said:

"Spongex Molded Cell-Tite is in a class by itself as an insulation material on flexible copper tubing. It certainly has solved a long-standing problem. We'd tried everything in the past; some were too slow and sloppy, others too bulky and rigid, and still others were supplied only in 3-foot lengths.

"With Cell-Tite, cutting the tubing to length is no problem at all. We simply use ordinary scissors. We don't have any messy gluing problem. Actually, the most inexperienced workmen can slip this material around a coupling, and achieve a tight fit."

Spongex Cell-Tite is durable rubber with millions of non-interconnecting cells, each acting as a separate insulator. This means Cell-Tite tubing not only protects against moisture condensation in the summer, but also withstands the high temperatures of winter heating.

As tubing, Spongex Cell-Tite is made with standard outside diameters of ¼", 1", 1¼", 1½", and can be made 1⅛", 1¾" and 2". Almost any inside diameter is available up to ¼" of the outside diameter in lengths up to fifty feet.

For more technical information write B. F. Goodrich Sponge Products Division, 281 Derby Place, Shelton, Conn.

B.F.Goodrich

SPONGE PRODUCTS DIVISION

281 DERBY PLACE, SHELTON, CONNECTICUT

Los Angeles County Engineers Building
SAVES $13,300 in AIR CONDITIONING with KOOLSHADE SUNSCREEN

Problem: The Los Angeles County Engineers Building was to be air conditioned. The building was equipped with Venetian blinds, but the engineers investigated several other window-shading devices in search for one that would do a better job of cutting air conditioning requirements.

Solution: Tests proved that solar heat transmission through the blinds—even when tightly closed—amounted to 1,102,000 BTU's. With KoolShade, only 232,000 BTU's. In refrigeration requirements, the difference amounted to 72 tons! Costwise, this reduction in tonnage adds up to a net saving of $13,300 over and above the cost of the KoolShade . . . and to this must be added the substantial annual savings from lower operation and maintenance of the cooling equipment.

By keeping the heat and glare of the sun *outside* the building, KoolShade Sunscreen eliminates hot spots and excessive loads . . . provides a balanced and trouble-free installation.

Only KoolShade Sunscreen offers

- **unsurpassed shading efficiency**—keeps up to 87% of the sun's rays off windows during the hottest part of the day—100 sq. feet of KoolShade reduces air conditioning load 1 ton.
- **80% clear visibility**—admits maximum glareless light.
- **harmony with all architecture**—improves building's appearance.
- **virtually no maintenance**—constructed of strong preoxidized bronze strips, wired and framed together, lasts for years, withstands hard blows.

Send today

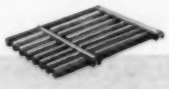
for this detailed and illustrated bulletin. And for expert help in cutting costs and sun problems, just request a call from a KoolShade engineer. No obligation or charge.

Distributer franchise still open in many communities for those who qualify.

KOOLSHADE Sunscreen BW

REFLECTAL CORPORATION
A subsidiary of Borg-Warner Corp.
310 S. Michigan Ave., Dept. K-6, Chicago 4, Ill.

ALFOL INSULATION



INGERSOLL ROOF DECK

EQUIPMENT DEVELOPMENTS
Continued

way "automatic" reversing valve; six-row coils. Units are water-to-air type, available as self contained or with separate compressor and fan sections for remote installation.

Drill-Hammer . . .

. . . with adjustable blow with three striking forces, "automatic" clutch—*Rawlplug Co., Dept. HPAC, 202 Petersville Rd., New Rochelle, N.Y.*

When drill point contacts masonry, clutch engages and hammer goes into action. Each revolution of drill becomes hammer blow.

Centrifugal Jet Pumps . . .

. . . in new, redesigned line of shallow and deep well convertible models—*Lancaster Pump and Mfg. Co., Dept. HPAC, Lancaster, Pa.*

Available individually and with standard vertical tanks. Designed for operation on shallow wells to 25 ft, are convertible to deep wells for depths to 80 ft. Cited feature is four volute construction for high efficiency.

Earth Boring Auger . . .

. . . designed to drill through soil to 10 fpm—*Hydrozion Engineering Co., Inc., Dept. HPAC, 2003 Indiana Ave., Kansas City 27, Mo.*

an active thermal barrier against the outside elements

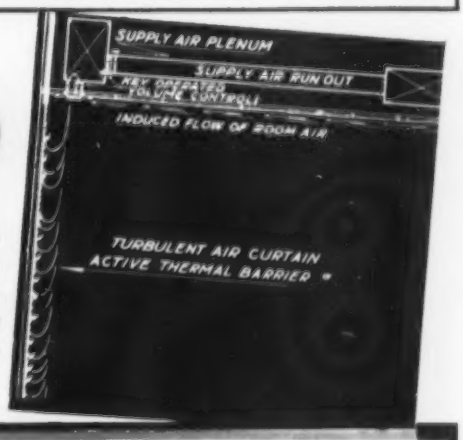
AIR-FACTORS INC

ACD

AIR • CURTAIN • DIFFUSER

An inconspicuous — neat appearing — mechanically effective AIR CURTAIN DIFFUSER for use with "Arcadia" type GLASS WALLS and sliding doors. AIR-FACTORS series ACD incorporates all of the patented features of the unequalled LCF (Laminar Counter Flow) Air Diffuser.

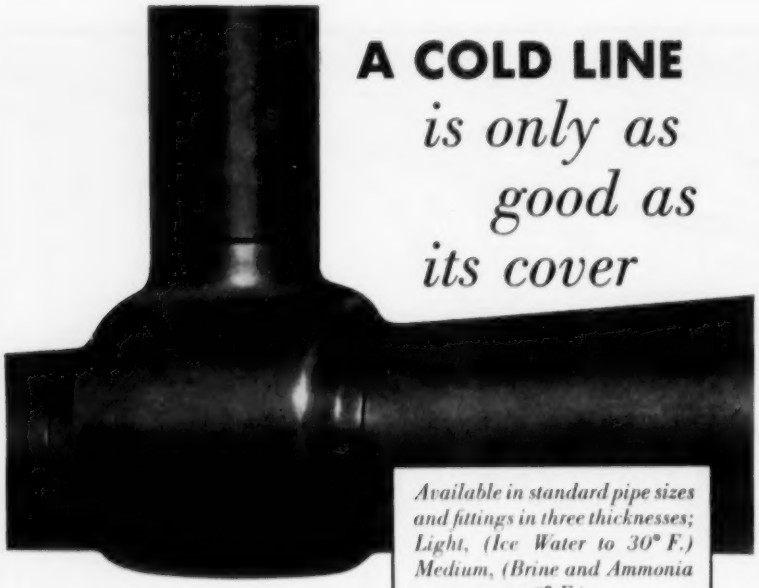
Write for Literature and Engineering Data.



AIR-FACTORS INC

1624 South Raymond Ave. Monrovia, California

MANUFACTURERS OF MOST COMPLETE LINE OF AIR DISTRIBUTION EQUIPMENT



A COLD LINE *is only as good as its cover*

Available in standard pipe sizes and fittings in three thicknesses;
Light, (Ice Water to 30° F.)
Medium, (Brine and Ammonia to 0° F.)
Heavy, (Heavy Brine—25° F. and lower.)

UNITED CORK PIPE COVERING

THE IDEAL COLD LINE INSULATOR

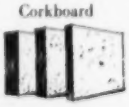
A cold line system is only as effective as its insulation. Inferior pipe covering in just one section of the line will cause operating costs to skyrocket and a considerable loss in dollars to the cold storage operator. United's pipe covering gives you the best insulation with all these advantages:

Extremely low "K" factor
Retains over 80% of cold loss on piping
Easy and economical to install
Long trouble-free life
Fire retardant—Vermin resistant
No capillarity

LARGER STOCKS—FASTER DELIVERY—PERSONAL SERVICE

United Pipe Coverings are available from stock for prompt delivery—to fulfill your immediate installation requirements. Mail the coupon below for additional information or the name of the United distributor nearest you.

Corkboard



Pipe Covering

Tank Lagging

UNITED BB CORKBOARD

Manufacturers of cork insulation for almost a half century

UNITED CORK COMPANIES
1 Central Ave., Kearny, New Jersey

UNITED CORK COMPANIES, 1 Central Ave., Kearny, N.J.
Please send United Cork Catalog. I am interested in
_____
NAME _____
FIRM _____
ADDRESS _____
CITY _____ ZONE ____ STATE _____

Engineering offices, or approved distributors, in key cities—coast to coast.

EQUIPMENT DEVELOPMENTS
Continued

Recommended by company for use by heating, piping, air conditioning contractors for hand boring requirements 1 to 8 in. diameter. Engineered to eliminate digging up of lawns, breaking up of streets. Drills through earth up to 100 ft. through dirt, hard pan, clay, sandy loam, shale, gravel, roots. Direction can be up, down, any angle.

Grilles . . .

. . . for return air, combustion air, ventilating, cooling systems—*Lima Register Co., Dept. HPAC, Lima, Ohio.*

Series "15H" horizontal grilles available in 57 sizes, "15V" vertical units in 56 sizes. Engineered to provide maximum free area. Made of one solid piece of heavy gage steel with horizontal fins. Vertical mullions an integral part of smooth face, says company.

Equipment Briefs . . .

HAND TOOL designed to drive "nails" into concrete with hammer—*Omark Industries, Dept. HPAC,* 5001 *S.E. Johnson Creek Blvd., Portland* 6, *Ore.* Requires no power source such as cartridges, electricity, air. Can be used where powder actuated tool use is not feasible, says company.

PORTABLE BAR RACKS for handling, storage of piping, tubing—*Palmer-Shile Co., Dept. HPAC,* 16072 *Fullerton, Detroit* 27. Design features act to prevent damage to stock in tiering, storing, company says.

FILTER for window type room air conditioners—*C. L. B. Co., Dept. HPAC,* 4000 *Gulf Freeway, Houston.* Is said to fit all brands, sizes. Material employed allows cutting of filter to fit. In size 15 × 24 in.

TURBINES with all steel welded rotors—*L. J. Wing Mfg. Co., Dept.*

ASK THE AEROFIN MAN

About Practical Heat Exchange

There is a competent Aerofin heat-transfer engineer near you—qualified by intensive training and long experience to find the *right* answer to your own particular heat-exchange problem—and backed by the research and production facilities of the pioneers in light-weight extended surface.

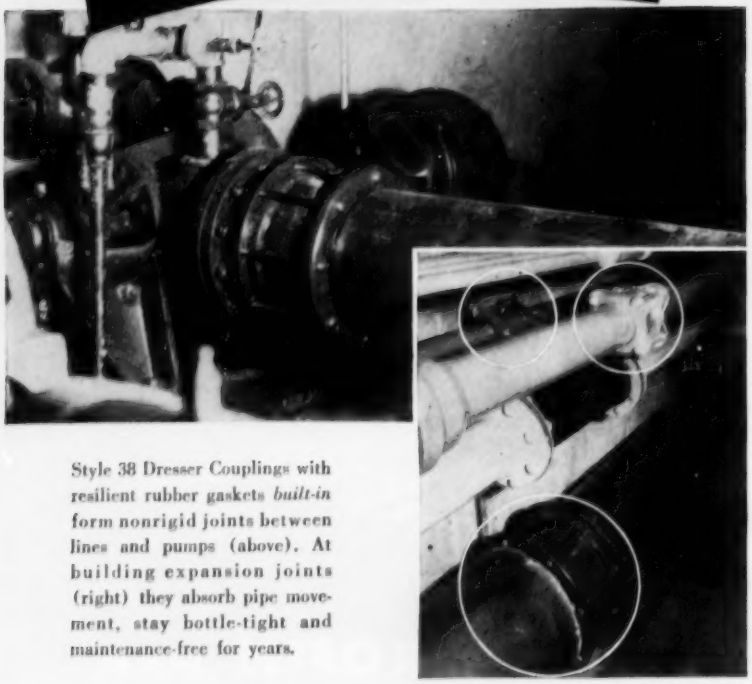
Ask the Aerofin Man.

Aerofin is sold only by manufacturers of nationally advertised fan system apparatus. List on request.

AEROFIN CORPORATION

101 Greenway Ave., Syracuse 1, New York

FOR INDUSTRIAL PIPING... the DRESSER way is *Easier... Surer!*



Style 38 Dresser Couplings with resilient rubber gaskets *built-in* form nonrigid joints between lines and pumps (above). At building expansion joints (right) they absorb pipe movement, stay bottle-tight and maintenance-free for years.

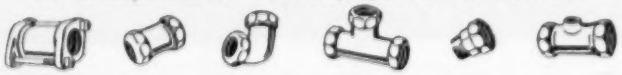
Whatever, wherever your pipe-joining jobs, Dresser Couplings mean time and money saved!

No troublesome aligning and joining problems, no complicated or costly operations. All you have to do is bring plain pipe ends together, Dresser-couple them, tighten the bolts with a wrench . . . and the job is finished. Dresser Couplings' resistance to impact, vibration and corrosion means highest dependability. Well suited to plant installations, they're easy to take off and transfer.

Style 65 Fittings come in sizes from ⅜″ to 2″; Style 38 Couplings are available to 12″ OD and over.

SEE YOUR LOCAL PIPING SUPPLIER TODAY

for the complete Dresser line of couplings, ells, tees, adapters, etc.



DRESSER®

ONE OF THE DRESSER INDUSTRIES

Dresser Manufacturing Division, 79 Fisher Ave., Bradford, Pa.

EQUIPMENT DEVELOPMENTS

Continued

HPAC, Linden, N.J. Design is cited safety feature of unit. Buckets are nickel steel, welded to periphery of rotor and capped by steel shroud, also welded.

LIQUID END for controlled volume pumps—*Milton Roy Co., Dept. HPAC,* 1300 *E. Mermaid Ln., Philadelphia* 18. "Plio-Tuf" recommended by company for low pressure, moderate temperature applications where chemical being pumped would corrode metals, alloys. Can be used on pumps with plunger diameters to 1 ⅛ in.

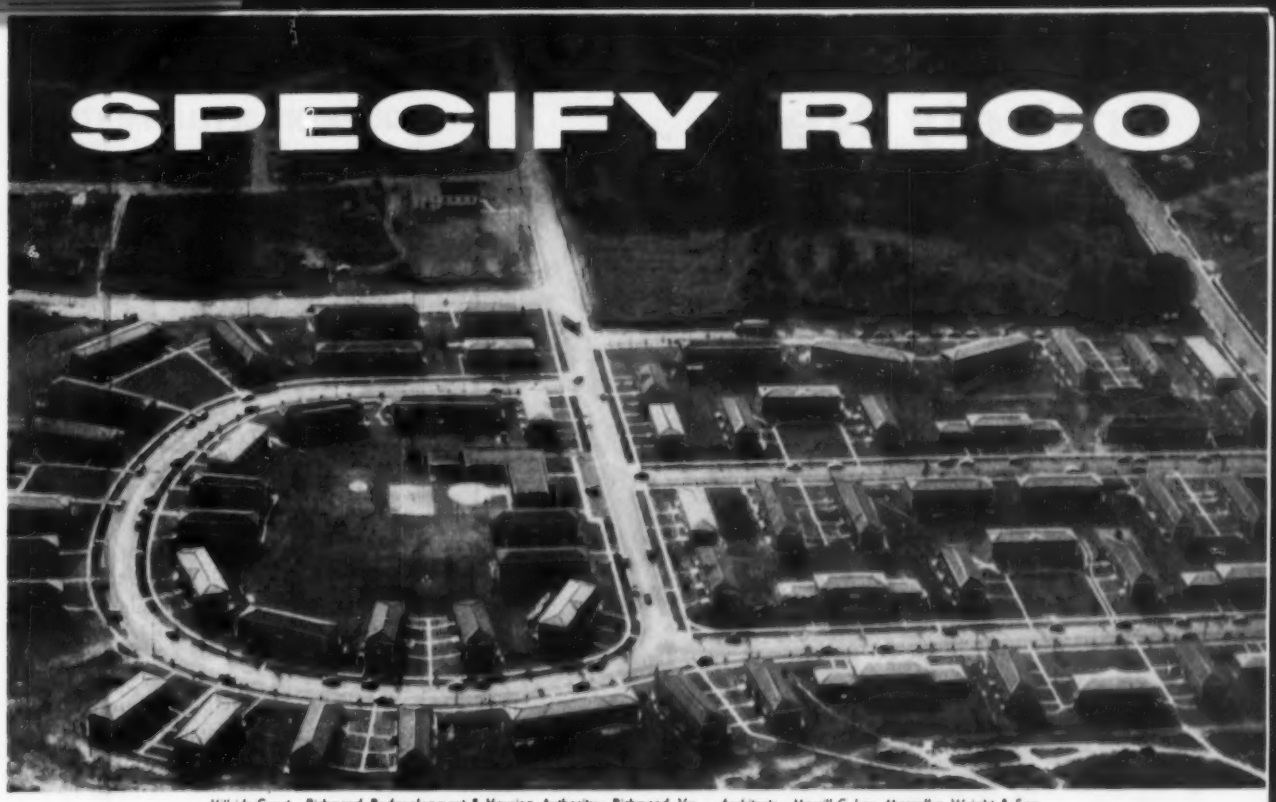
NONPOROUS RUBBER COMPOUND with "super soft" construction—*Roth Rubber Div., Vapor Heating Corp., Dept. HPAC,* 1860 *S. 54th Ave., Chicago.* Softness characteristic is 5 durometer. Can be used in temperatures to 200 F. Recommended by company to absorb vibration, dampen sound, or for use as gasket.

THERMAL CUTOUT designed to protect "Flexidyne" dry fluid drive against overheating—*Dodge Mfg. Corp., Dept. HPAC, Mishawaka, Ind.* If overload causes prolonged slipping, consequent heating of unit, cutout trips switch, cutting off power and, if desired, giving alarm.

LINER for plastic pumps—*Vanton Pump & Equipment Corp., Dept. HPAC,* 201 *Sweetland Ave., Hillside, N.J.* Chemical resistance of elastomer liner permits pumping of highly corrosive products under severe conditions, says company. Available in company's pumps in capacities 1/3 to 5 gpm.

SURFACE FLAW detecting process for locating cracks, fractures, cold shuts, tiny surface fissures, porosity, imperfect welds on iron, steel, brass, aluminum, plastics—*Zip Abrasive Co., Dept. HPAC,* 1360 *W. Ninth St., Cleveland* 13. Uses two-step dye and detector method. Defects appear against opaque background.

SPECIFY RECO



Hillside Court—Richmond Redevelopment & Housing Authority—Richmond, Va. *Architects*—Merrill C. Lee; Marcellus Wright & Son.
Consulting Engineer—W. A. Brown, Richmond, Va. *Mech. Contractor*—William H. Singleton Co., Inc., Arlington, Va.

Award Winning Slum Clearance Project Picks RECO Hot Water Storage Heaters

THE FEDERAL PUBLIC HOUSING ADMINISTRATION and the American Society of Landscape Architects agreed. In a nationwide study of 1408 slum clearance housing projects, they cited Hillside Court in Richmond, Virginia, as "outstanding and noteworthy" in design and architectural achievement.

AND THE CONTRACTORS PICKED RECO Heat Exchange Equipment to supply plenty of hot water to the 402 dwellings of Hillside Court and the 504 units of its sister project, Creighton Court.

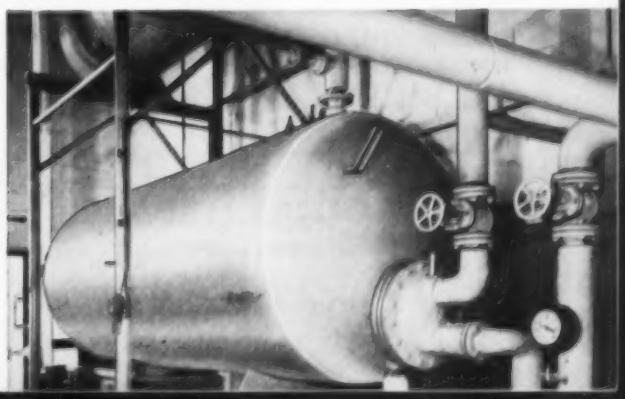
SIX RECO CEMENT-LINED HOT WATER STORAGE HEATERS and expansion tanks—three for each project—supply approximately 8300 gallons of pure, rust-free hot water per hour.

RECO HYDRAULIC CEMENT LINING IS JUST ONE of RECO'S many special corrosion-resistant coatings and linings. Your *own* water problem may call for one of the others such as tough, baked-on plastics, copper lining, copper silicon, clad steel or hot-dipped galvanizing. But whatever your need, let RECO help you solve it. Consultation is free from cost or obligation.

RECO'S COMPLETE LINE OF HEAT EXCHANGERS has an international reputation for outstanding performance, top quality, competitive prices and quick delivery. Rely on this reputation on your next heating job—SPECIFY RECO! Write today for free catalogs and the name of your nearest RECO representative.

Richmond Engineering Co., Inc.

Dept. J, 7th & Hospital Sts., Richmond 5, Virginia—Phone 7-2611



Entirely New . . .
in gas unit heaters

Now — Modine has stepped even further ahead of the field . . . with a gas-fired unit heater as superbly beautiful as it is functional.

America's most beautiful gas-fired unit heater gives you:

- **LIGHTER WEIGHT** — Modines are up to 50% lighter than other makes. They are easier to install . . . cost less to ship and handle.
- **NEW PERFORMANCE** — Modines feature improved stainless steel burners and choice of stainless or aluminized steel heat exchangers.
- **QUIETER OPERATION** — Lower speed motors and resilient motor mountings assure silent operation at capacity heat delivery.
- **WIDER RANGE OF SIZES** —Eight models . . . 25,000 to 310,000 Btu. For natural, manufactured, mixed, LP and LP-air gas mixtures.

MODINE MFG. CO.
1569 DeKoven Ave., Racine, Wisconsin

Please send me your free bulletin 656.

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CITY .....ZONE .....STATE .....

GU-1321

EQUIPMENT DEVELOPMENTS
Continued

PIPE SEALING COMPOUND with teflon base—*Crane Packing Co., Dept. HPAC, 6400 Oakton St., Morton Grove, Ill.* Formulated to seal chemicals, corrosives. For services to 212 F. Is said to have very low coefficient of friction.

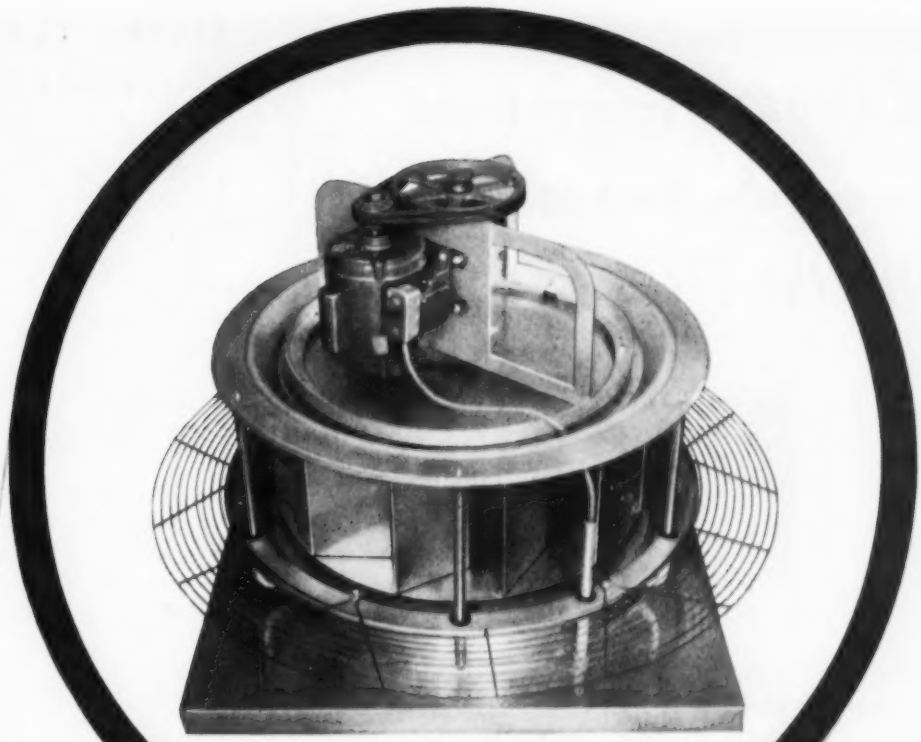
CLAMP CUTTER designed for removing company's hose clamps—*Punch-Lok Co., Dept. HPAC, 321 N. Justine St., Chicago 7.* New 14 in. cutter is carbon steel, features single cutting jaw (with slip land, to prevent gouging of hose) while other jaw functions as buttress edge.

BLUEPRINT HOLDERS in two new large sizes—*Momar Industries, Dept. HPAC, 4323 W. 32nd St., Chicago 23.* Sizes are 36, 48 in. long. Can be used on company's regular "Glider" blueprint rack. Holders secure prints without punching holes in them. ‡

The law of averages says that cancer will kill one out of every six Americans. But the law does not have to prevail. You can help break it in two ways. By having a thorough medical checkup every year . . . and by sending a contribution to your Unit of the American Cancer Society or to Cancer, c/o your town's Postmaster.

Fight cancer with a checkup and a check.

AMERICAN CANCER SOCIETY



Jenn-Air Belt Drive Roof Exhauster with cover removed. Fewer parts and superior engineering assure long life and smooth, quiet operation.

INDUSTRIAL FANS TOO... Can Meet Modern Design Requirements

JENN-AIR belt drive

power roof exhausters complement the roof lines of today's buildings

The trim beauty of low contour Jenn-Air Roof Exhausters complements architectural design.

Modern factory and commercial buildings are being planned for appearance as well as utility. Jenn-Air's years-ahead design meets both requirements. No longer is it necessary to rely on industrial-type exhausters of out-dated design, to meet the higher capacity requirements. Instead, Jenn-Air's Belt Drive Roof Exhausters combine low contour streamlining with new rugged construction.

Every part is carefully engineered to the most rigid standards. The BRIDGE BUILT POWER UNIT is completely isolated from the base to eliminate vibration and sound transmission. Heavy gauge all aluminum construction – same as in the popular Jenn-Air Direct Drive Exhausters – gives strength without weight... saves maintenance dollars.

There's a Jenn-Air Belt Drive Roof Exhauster to solve your industrial or commercial ventilating problem. Available in a range of sizes to 24,000 CFM... all with the same spun aluminum low contour beauty.

Jenn-Air Exhausters are rated in accordance with the Standard Test Code by the Texas Engineering Experiment Station.

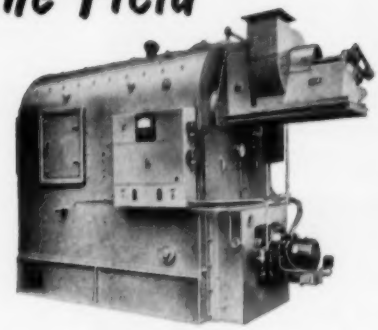
JENN-AIR PRODUCTS COMPANY, INC.

1102 Stadium Drive, Indianapolis 7, Indiana

Compare International

Water Tube Package Boilers

with the Field



- **Ample Furnace Volume—low heat release rates**
- **Convertible to Coal Firing**
- **Reserve Capacity Always Available**
- **Rapid Directed Water Circulation**
- **Maximum Heat Absorption—quick steaming**
- **Induced Draft—quiet operation**
- **Fully Coordinated—fire tested**
- **Oil, Gas or Combination Firing**

Package boilers can also be shipped, less burner and controls, for installation by local contractors in accordance with International's standard package specifications.

and You Will Specify

INTERNATIONAL WATER TUBE HEATING and POWER BOILERS

It will pay you to specify International, the boilers with extra profits built in. We will gladly send these International Bulletins:

No. 600 —Water Tube Package Units
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THE INTERNATIONAL BOILER WORKS CO.

Steel Firebox Heating & Power Boilers Low & High Pressure Water Tube Package Boilers • International-LaMont Forced Recirculation Generators • ASME Code Pressure Vessels & Welded Products.

810 Spruce St. **East Stroudsburg, Pa.**

RECENT TRADE LITERATURE . . .

▸ *AIR CONDITIONERS* — Catalog 56C6a on "Recold RE" remote air conditioners incorporates dimensional changes on unit and new tapered back design which permits air intake from rear. Specifications given for ½, ¾, 1 ton sizes. *Refrigeration Engineering, Inc., Dept. HPAC, 7250 E. Slauson Ave., Los Angeles* 22.

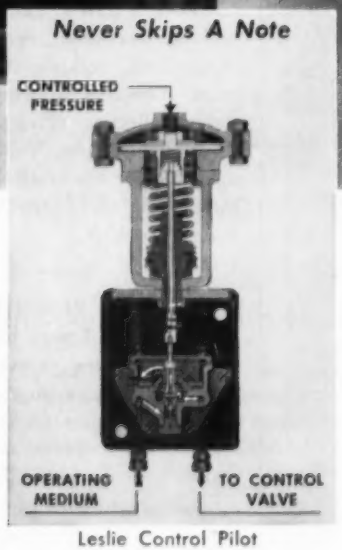
▸ *AIR CONDITIONING* — Line of central station cabinet type air conditioning units is subject of new 52 page data book, bulletin No. C-1100-B86 P. Literature designed to aid architects, engineers in selecting correct size of company's units for any type installation. *Worthington Corp., Dept. HPAC, Harrison, N. J.*

▸ *AIR COOLED CONDENSERS* — Data sheet E.M.P.-56110 covers complete line of air cooled condensers. Units recommended by company for use as boosters to existing systems which may require additional capacity or where design conditions have varied, causing systems to become undersized. Capacities range 2 to 10 tons. *Drayer-Hanson, Inc., Dept. HPAC, 3301 Medford St., Los Angeles* 63.

▸ *ALUMINUM — Alcoa Aluminum Handbook* presents tabular data on aluminum alloys, mill products. Contains information on alloy standards, properties, sizes, tolerances. *Aluminum Co. of America, Dept. HPAC, 781 Alcoa Bldg., Pittsburgh* 19.

▸ *ALUMINUM* — Bulletin covers new stocks of aluminum added to service Chicago, Milwaukee, surrounding area, markets. Included is information on plates, sheets, coils, rods, bars, along with data on company's forming, shearing, slitting, sawing facilities. *Joseph T. Ryerson & Son, Inc., Dept. HPAC, Box 8000-A, Chicago* 80.

Here's a Quartet of Control Pilots that Sings a Song of Savings



Leslie Control Pilot
Type PDA
Sectional View

NEVER A DISCORDANT NOTE from this quartet - - - they're always in tune - - - each unit doing its part to create 24-hour-a-day harmony. They save time — no personal attention or manual assistance required after they're set. Pressures stay at set point for top efficiency of process equipment in the line. Positive response of pilot and valve assures smooth throttling action within closely held limits.

The same smooth action and accurate control is provided even when extreme reductions are necessary (there are Leslie installations handling reduction of 2150 psi. to 5 psi. in one step!) Responds to pressure deviations as small as .025 psi., depending on pilot range.

For more information on controllers that save maintenance dollars, consult the nearest Leslie Engineer listed in your classified telephone directory under "Valves" or "Regulators". Use this help for economy in temperature and pressure regulation.

Bulletin 5303 sings the whole song. Send for it today.

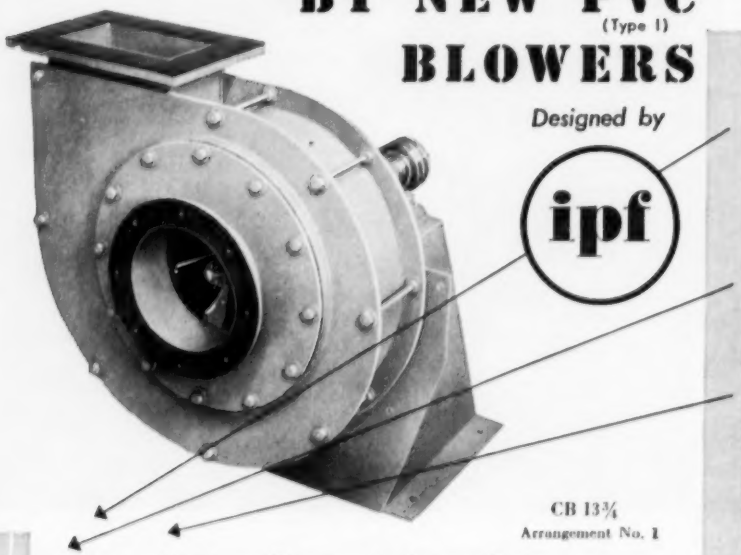
TRADE LESLIE MARK

REGULATORS AND CONTROLLERS

LESLIE CO., 237 GRANT AVENUE, LYNDHURST, NEW JERSEY

OUTMODED BY NEW PVC (Type 1) BLOWERS

Designed by **ipf**



CB 13¾
Arrangement No. 1

If your problem is expelling corrosive fumes and gases, you need IPF Blowers. Ordinary blowers are susceptible to attack by these fumes and gases. Coating the blower is costly — and not foolproof. Maintenance and replacement costs are high . . . and valuable time is lost. Result — an expelling operation that eats into profits.

For trouble-free, long-life blowers, specify **IPF** blowers made of Unplasticized, Rigid Polyvinyl Chloride (UPPVC). UPPVC — the new construction material — exhibits inherent anti-corrosive qualities that allows **IPF** Blowers to withstand most chemical fumes and gases from 40°F to 140°F. Actual installations of **IPF** Blowers have lasted three times the normal life of ordinary blowers . . . and continue to function efficiently.

UPPVC is a lightweight . . . smooth surfaced . . . nonporous material of construction. Lightweight construction means greater capacity per B.H.P. . . . easier installation . . . reduced handling problems. Smooth, nonporous finish never require painting or maintenance expense. **IPF** Blowers are not subject to unbalance from chipping of a protective coating . . . because there is no coating. It's solid UPPVC.

IPF Blowers made of UPPVC are available in standard sizes that provide displacements from 143 C.F.M. to 7722 C.F.M. Standard wheel sizes of 9½, 13¾, 19, and 27 inches. Other sizes and capacities can be custom designed to fit special requirements. Full details on the new **IPF** Blowers available upon request.

Full details on the new IPF Blowers available on request.

MANUFACTURED BY
industrial plastic fabricators, inc.
NORWOOD, MASS. NOrwood 7-3411

RECENT TRADE LITERATURE

Continued

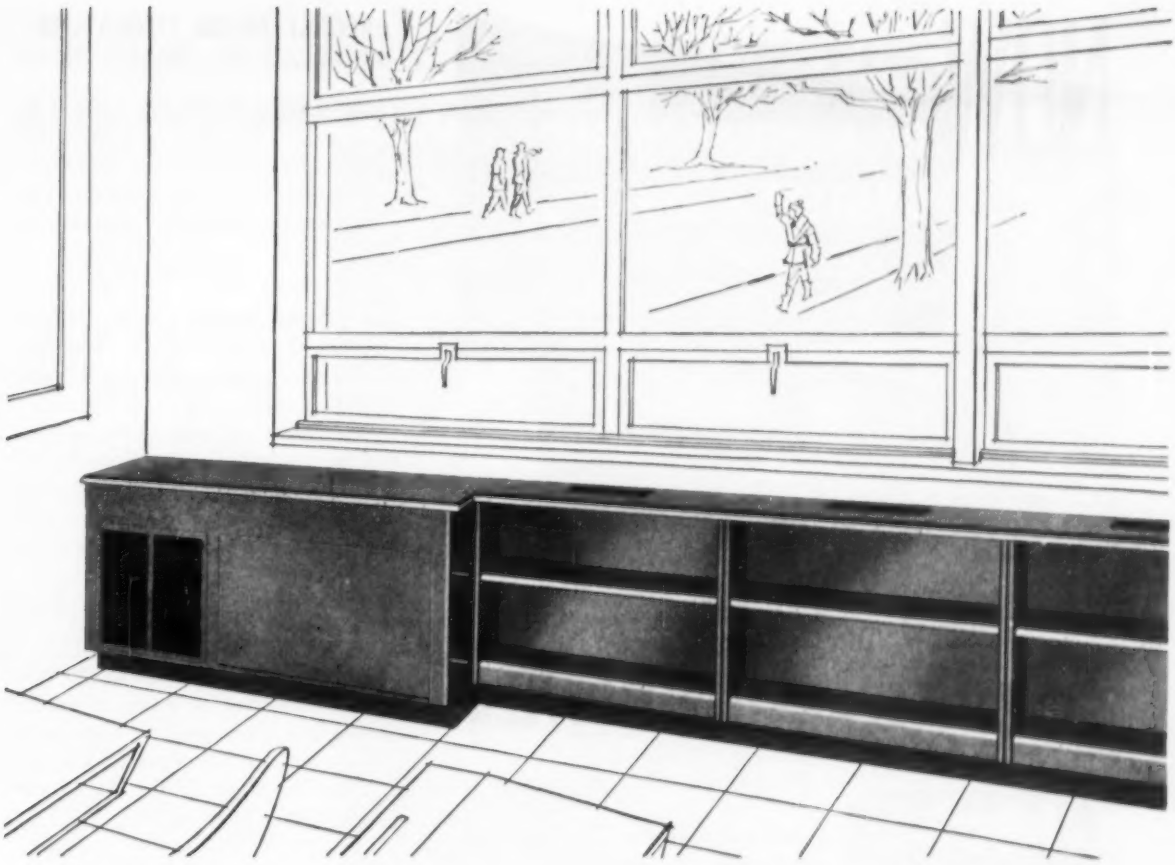
▸ *BASEBOARD INSTALLATION* — Baseboard installation booklet contains 14 pages of step-by-step instructions, illustrated by photographs. Also described is use of each item in company's new line of steel baseboard accessories. *Crane Co., Dept. HPAC, 836 S. Michigan Ave., Chicago 5.*

▸ *BOILERS* — Catalog AP-295 gives product description, plus dimensions and engineering data, to help in specification and installation of correct type of company's "Wet Back" Scotch type boilers. Units engineered for natural draft application with oil or gas burners. *Pacific Steel Boiler Div., National-U. S. Radiator Corp., Dept. HPAC, Johnstown, Pa.*

▸ *CENTRIFUGAL DUST COLLECTOR* — New 12 page booklet explains operation, construction of "Cyclo-trell" multiple tube dust collector. Contains drawings, cutaway views, collection efficiency and capacity nomigraphs. Tables give design data for six available sizes. *Research Cottrell, Inc., Dept. HPAC, Bound Brook, N.J.*

▸ *CHEMICAL RESISTANT COATINGS* — New 4 page bulletin Chem C-2 details three general classes of chemical resisting organic coatings developed to meet needs of processing industries. These are: "Ucilon" coating systems applied like paint for general corrosion control; "Unichrome plastisol" compounds for heavy duty service; "Unichrome" special materials for lining steel drums, tanks. *Metal & Thermit Corp., Dept. HPAC, Rahway, N.J.*

▸ *COLD WATER DEAERATOR* — Publication 4563 describes advantages of cold water deaerator, its principles of operation. Cited features of unit are: reduces or eliminates corrosion; provides complete deaeration without heating and cool-



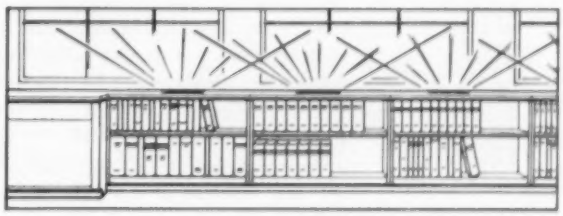
Now you can plan economical classroom comfort with the Norman Schoolroom System

gas-fired forced air heating and ventilating with Util-i-Ducts

The Norman Classroom Package helps keep school construction costs down. It is a completely automatic gas-fired forced air perimeter heating and ventilating system which eliminates the extra cost and space required for a central heating plant. Each room has its own individual heating and ventilating system. Any number of additional classrooms can be added later without expensive revamping as required with a central heating plant.

The exclusive Norman Schoolroom System automatically filters and mixes outdoor air and room air to maintain a healthful and comfortable climate. It automatically compensates for variations in the heating and ventilating requirements caused by changes in occupancy and outside weather conditions. Outside air only is used for combustion.

Util-i-Duct sections are designed to blanket the outside walls with controlled tempered air and also provide handy bookshelf space. Each section has an individual diffuser with damper and adjustable louvers for accurate balancing and uniform distribution. Sections can be extended around the outside walls and under windows — available in standard length sections, corner units and adjustable filler sections to flush in with wall partitions.



Util-i-Duct sections assure proper air distribution for complete classroom comfort and provide bookshelf space.

Norman® products company

Mail the coupon today for full details and specifications

NORMAN PRODUCTS CO.
1156 Chesapeake Ave., Columbus 12, Ohio
Please send me complete information on the Norman gas-fired, forced air Schoolroom Heating and Ventilating System.

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CITY _____ STATE _____

NOW

OIL SEPARATION AND SYSTEM SILENCING

ENGINEERED INTO A SINGLE UNIT

the HEAT-X 'OSM' OIL SEPARATOR-MUFFLER

heat-x

Silencing is more than just *incidental* and *partial* with Heat-X 'OSM' Oil Separator-Mufflers. These units were *specifically engineered* to completely silence all system noises and absorb all pulsations from the compressor . . . *in addition to* separating entrained oil.

And these "all-in-one" units make float troubles a thing of the past. 'OSM' Oil Separator-Mufflers have *no floats* to hang open or stick closed. Instead, units incorporate a positive action Velocity Pressure Mechanism, *exclusive with Heat-X*, which opens only when compressor is running . . . closes of its own weight when compressor stops.

Ratings based on *tonnage*, not *horsepower*, permit close matching of unit to requirements . . . eliminate need to buy more than required capacity.

Ruggedly constructed to A.S.M.E. specifications. Available in capacities from 1 to 75 Tons F-12 and 1 to 100 Tons F-22.

REQUEST FREE DESCRIPTIVE CATALOG.

HEAT-X, Inc.

BREWSTER • NEW YORK

RECENT TRADE LITERATURE

Continued

ing; has large spilling edge for deaerating efficiency; multiple stage units permit economical deaeration. *Cochrane Corp., Dept. HPAC, 17th St. below Allegheny, Philadelphia* 32.

▸ *COMBUSTIBLE GAS DETECTION EQUIPMENT* — Specification sheet details models "E" and "EE" combustible gas detection equipment and sample drawing accessory. Includes operational and construction data, application suggestions, prices. *Johnson-Williams, Inc., Dept. HPAC, 2625 Park Blvd., Palo Alto, Calif.*

▸ *COMBUSTION CONTROL* — Three most important factors in combustion control — safety, efficiency, long life of equipment — detailed in new bulletin. *Cleveland Fuel Equipment Co., Dept. HPAC, 1111 Brookpark Rd., Cleveland 9.*

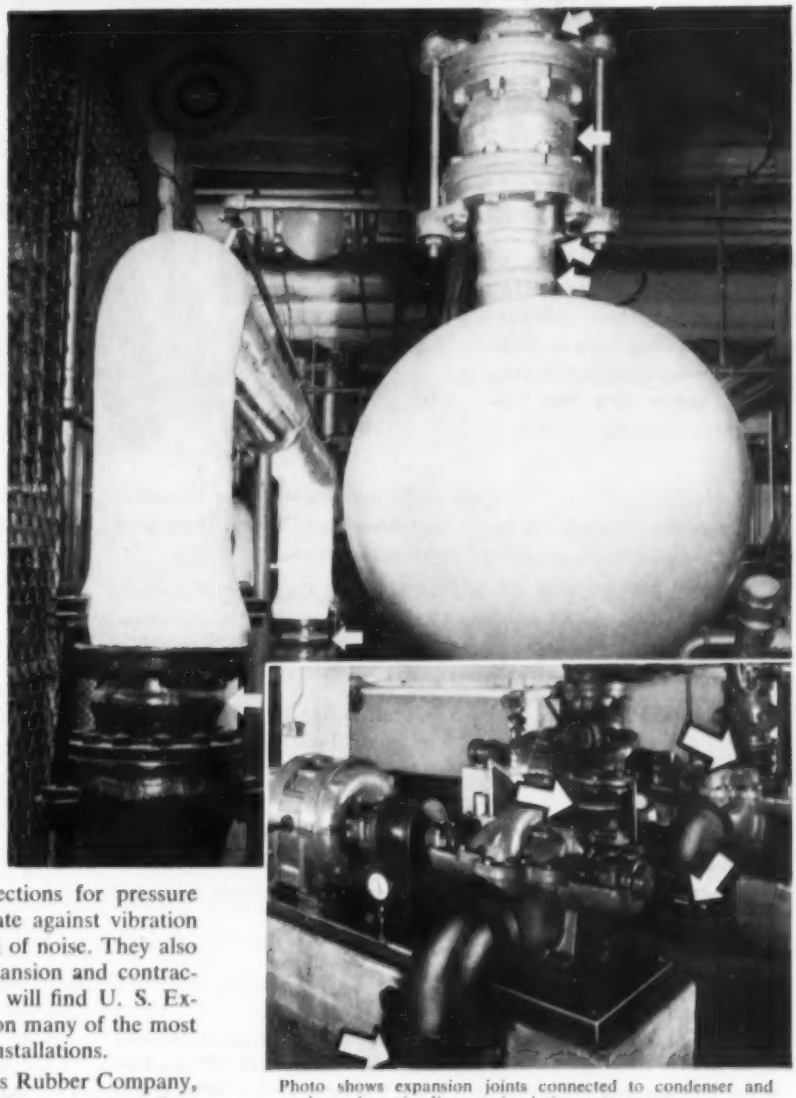
▸ *CONDENSATION RETURN UNITS* — Bulletin 4958-B describes new line of single and duplex "Hotshot" condensation return pumping units. Performance tables rate units to 10,000 sq ft of radiation with discharge pressures to 50 lb. Includes construction features, dimensions. *Deming Co., Dept. HPAC, Salem, Ohio.*

▸ *COOLING CONTROLS* — Bulletin 710B describes "self powered" cooling controls for compressors, stills, solvent coolers, degreasers, oil coolers, small engines, condensers, etc. Includes operational drawing, hookup sketches. *Sarco Co., Inc., Dept. HPAC, Empire State Bldg., New York 1.*

▸ *DEAERATOR* — Publication 4654 describes deaerator design for hot water line protection in office buildings, hotels, hospitals, industrial plants. Includes dimensional drawing, table. *Cochrane Corp., Dept.*

FOR SILENT, VIBRATION-FREE AIR-CONDITIONING SYSTEMS

Prevent transmission of compressor noises in circulating lines with U. S. Rubber Expansion Joints



A compressor with expansion joints on the suction and discharge lines. Suction line is at bottom, discharge line at top. Expansion joints were vulcanized to welded flanges at our factory, to handle Freon in the compressors.

These flexible rubber connections for pressure and vacuum pipe lines insulate against vibration and prevent the transmission of noise. They also offset stresses caused by expansion and contraction and misalignment. You will find U. S. Expansion Joints are standard on many of the most up-to-date air-conditioning installations.

A product of United States Rubber Company, these U. S. Expansion Joints have many applications in air conditioning: they are used for the chilled-water lines from the water chillers, and the refrigerant lines from the refrigerating compressors; also the water lines to and from the cooling towers. They are used on the header connections to the condenser and to the cooler and on pipe lines at the circulating water pump.

For handling Freon in compressors, there is a specially-designed U. S. Freon Expansion Joint.

Photo shows expansion joints connected to condenser and cooler and on pipe lines at circulating water pump.

Since they have no moving parts to wear or bind, U. S. Expansion Joints last a long time. Some are still in service after 30 years—a record unmatched by any other expansion joint! U. S. Expansion Joints will solve any pipe line problem caused by noise, vibration and misalignment. They are obtainable at any of the 27 "U. S." District Sales Offices, or write us at Rockefeller Center, New York 20, N. Y.

Watch NCAA football, Saturday afternoons, NBC-TV

US RUBBER

Mechanical Goods Division

United States Rubber

Four Good Reasons for Specifying

GOODALL EXPANSION JOINTS

Because they are made of rubber, Goodall Expansion Joints have certain advantages stemming from rubber's natural characteristics. Among these are the following:

1—LONGER SERVICE LIFE. Continuous movement during expansion and contraction actually keeps the rubber joint "alive". There is no deterioration through embrittlement or corrosion.

2—SENSITIVE RESPONSE TO PRESSURE. Only the slightest pressure is required to create movement in the rubber joint, in any direction. Stress on metal pipe or other connected member is therefore reduced to an absolute minimum.

3—EASIER TO INSTALL . . . on new construction or as replacements for other types. Light in weight . . . short face-to-face dimensions . . . retaining rings or flanges quickly aligned and bolted. No gaskets required.

4—AVAILABLE IN "FLANG-LOK" STYLE . . . a patented Goodall development which provides exceptional ease of installation; a far greater sealing face area than the standard right-angle style; and a seal that is completely non-metallic.

* * *

Goodall Rubber Expansion Joints are custom-built to meet specific requirements in sizes from ⅜" I. D. to 96" I. D., for pressures up to 125 lbs. P.S.I. and/or vacuum. They are available in Right Angle and Sleeve Types, as well as "Flang-Lok"; single or multiple arch; tapered; offset; and rectangular.

* * *

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"If it's GOODALL, it MUST be Good!"

Standard of Quality—Since 1870

HOSE · BELTING · FOOTWEAR · CLOTHING AND OTHER INDUSTRIAL RUBBER PRODUCTS

GOODALL *Rubber Company*

GENERAL OFFICES, MILLS and EXPORT DIVISION, TRENTON, N. J.

Branches and Distributors Throughout the United States and in Canada

RECENT TRADE LITERATURE

Continued

HPAC, 17th St. below Allegheny, Philadelphia 32.

▸ *DIAPHRAGM PRESSURE SWITCH* — Brochure cites features of company's "Model 420" diaphragm pressure switch. Actual size cutaway drawing illustrates construction. *Barksdale Valves, Dept. HPAC, 5125 Alcoa Ave., Los Angeles 58.*

▸ *DIFFUSERS, REGISTERS, GRILLES* — New 32 page catalog covers company's line of diffusers, registers, grilles for heating, cooling. Includes installation and air diffusion pattern photographs, specifications, performance data, engineering information. *Lima Register Co., Dept. HPAC, Lima, Ohio.*

▸ *DIHEDRAL COUPLINGS* — Catalog No. 62 covers "Series D-100" standard, floating shaft, mill motor type dihedral couplings. Data given on sizes, capacities, dimensions of units designed to handle angular and offset misalignment to 12 deg. *Ajax Flexible Coupling Co., Inc., Dept. HPAC, Westfield, N.Y.*

▸ *DIRECT EXPANSION COILS* — Set of ratings for selection of direct expansion coils offered in catalog 52C6a. Literature provides tables covering entering air conditions of 50 to 85 F in 1 deg increments, 55 to 105 F entering dry bulb, with refrigerants 30 to 50 F, velocities of 400 to 600 fpm at 50 fpm intervals. *Refrigeration Engineering, Inc., Dept. HPAC, 7250 E. Slauson Ave., Los Angeles 22.*

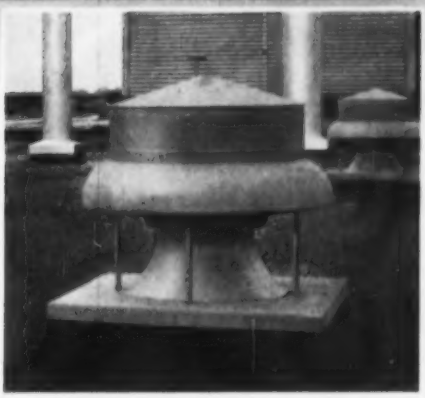
▸ *DRIVE, THREADER* — "Porto-Mite Super Drive" and "No. 78" threader covered in bulletin form PM656. Literature cites construction features of both tools, benefits to user, prices. Capacities listed. *Beaver Pipe Tools, Inc., Dept. HPAC, Warren, Ohio.*

▸ *ELECTRIC HEATERS* — Revised catalog 27-620 describes industrial

44 Gallaher Air-Vans® EFFICIENTLY

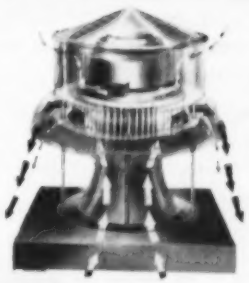
ventilate the new, multi-million dollar DITTO plant

At the new Ditto, Inc. plant at Lincolnwood, Illinois, low installed silhouette does not break the long, clean lines of the building.



Weatherproof design and finish cut maintenance costs—help keep Air-Vans operating at top capacity.

Ditto, Inc., officials insisted upon "the best equipment available" to remove the fumes of fluids, carbons and other products used in duplicating. The Otto A. Wendt ventilating firm, with more than 40 years in the field, chose 44 Air-Vans for the 312,000 square foot building. Battey & Childs, the architectural and engineering firm, approved the selection, for appearance and function.



Exclusive patented scroll design assures high performance against S.P. to 4". (Certified ratings)

WHEN YOU SPECIFY POWER ROOF EXHAUSTERS SPECIFY GALLAHER AIR-VANS

Gallaher Air-Vans have been specified for thousands of public and industrial buildings. These features guarantee high performance —rugged construction, weatherproof design, safe fume handling system, availability in special metals, certified ratings and are shipped to site completely assembled for fast, economical installation.

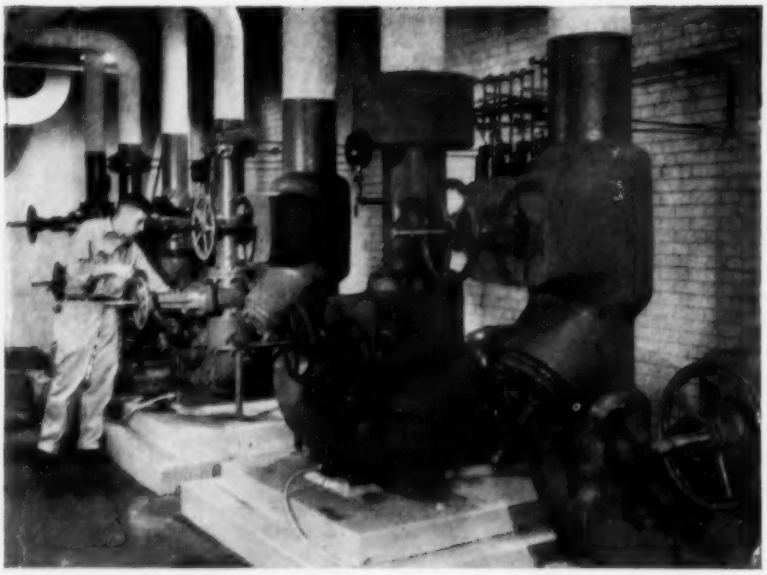
For full information on Air-Vans write to:

The GALLAHER Company

Omaha, Nebraska **4108 Dodge Street**

Export office 306 Paul Bldg., Utica 2, N.Y. Cable "Keiserquip"

MANUFACTURERS OF POWER ROOF EXHAUSTERS BASED ON DESIGN RESEARCH



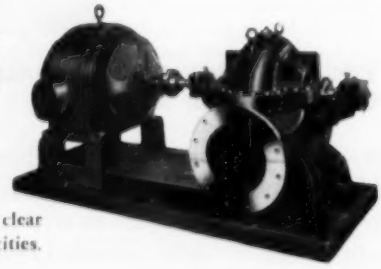
Performance Inswrance
FOR YOUR INSTALLATIONS

"BUFFALO" — THE PUMPS OF KNOWN TOP QUALITY

It's a real satisfaction to *know* the pumps won't be a weak link in your installation. And you *can* know it, when you order "Buffalo" Pumps — their record for reliability over the past 79 years is proof. But even more important to you, they embody the best and latest practical developments in the light of all this experience.

Before your next job, check the quality or "Q" Factor* that goes into "Buffalo" Pumps like this Double Suction Type SL serving many of the country's finest installations. Write for Bulletin 955P and see why it *does* make a difference to have the best!

*The "Q" Factor — the built-in Quality which provides trouble-free satisfaction and long life.



"Buffalo" Double Suction Pump for clear water service. 10 to 14,000 gpm capacities.

"Buffalo" PUMPS

BUFFALO PUMPS
DIVISION OF BUFFALO FORGE COMPANY
171 MORTIMER ST. • BUFFALO, N. Y.
Canada Pumps, Ltd., Kitchener, Ont.
Sales Representatives in all Principal Cities

A BETTER CENTRIFUGAL PUMP FOR EVERY LIQUID

RECENT TRADE LITERATURE
Continued

electrical heating units, devices. Contains information, design selection charts on strip heaters, natural and forced convection air heaters, oven heaters, immersion heaters, cartridge heaters, melting pots, industrial hot plates, heater control equipment. *Westinghouse Electric Corp., Dept. HPAC, P. O. Box 2099, Pittsburgh.*

▸ *ELECTRONIC AIR CLEANERS* — New 8 page catalog E-40 covers line of packaged electronic air cleaners. Describes custom built models in detail, including engineering data, size and capacity tables. *Trion, Inc., Dept. HPAC,* 1000 *Island Ave., McKees Rocks, Pa.*

▸ *EXPANSION JOINTS* — New 72 page catalog 56 covers design, manufacture, application of company's line of packless corrugated expansion joints, including three new types. Illustrated with photographs, drawings, schematic diagrams. Tables, charts give engineering specifications. *Zallea Bros., Dept. HPAC,* 895 *Locust St., Wilmington* 99, *Del.*

▸ *FHP MOTORS* — Characteristics, performance ranges of fractional horsepower motor types charted in motor selector chart. Speed torque curves for basic motor types illustrated as well as other motor data. *Howard Industries, Inc., Dept. HPAC,* 1760 *State St., Racine, Wis.*

▸ *FORGED STEEL FITTINGS* — New 28 page bulletin A-3-56 contains dimensional, engineering, application data on forged steel screw-end and socket-welding fittings for high pressure service. Catalog features reorganization of data into simplified charts. *W-S Fittings Div., H. K. Porter Co., Inc., Dept. HPAC, Roselle, N.J.*

▸ *GAS VENTING* — "Safety System" gas vent tables designed as simple, yet comprehensive guide to safe, correct gas venting. Charts

tested and proved throughout the nation...
the BIG advance in Air Conditioning!

GOVERNAIR
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AIR CONDITIONERS

EVAPORATIVE CONDENSERS

COOLING TOWERS

UNIT COOLERS

BLAST COILS FOR HEATING AND COOLING

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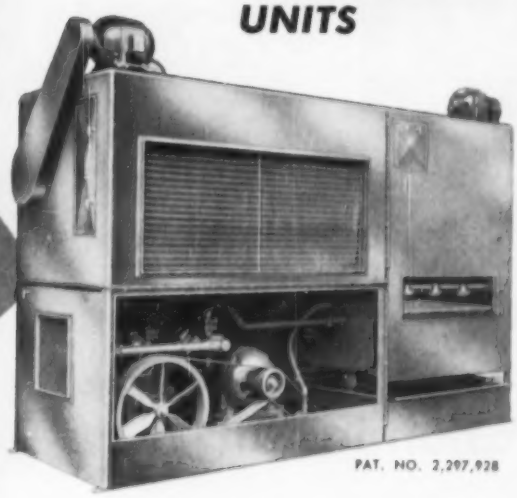
SELF CONTAINED UNITS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- COMPLETELY FLEXIBLE to meet any special load conditions or space requirements.

GOVERNAIR has been building completely packaged air conditioning units longer than any other company in the field. Today, this valuable experience gained, in making hundreds of different types of installation, can benefit you on nearly any type of job you may be planning.

For, only GOVERNAIR offers the installation advantages of compact one-unit design . . . combined with our manufacturing flexibility that enables you to successfully meet unusual load conditions, space or multi-zone requirements.

Added to this is the GOVERNAIR reputation for quality-engineered, longer life products . . . designed to operate at maximum efficiency and economy. *Write for full information.*

ORIGINATORS OF COMPLETELY PACKAGED AIR CONDITIONERS. READY TO OPERATE WITH SIMPLE ELECTRICAL, WATER AND DUCT CONNECTIONS

GOVERNAIR
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ONE OF THE GARLOCK 2,000

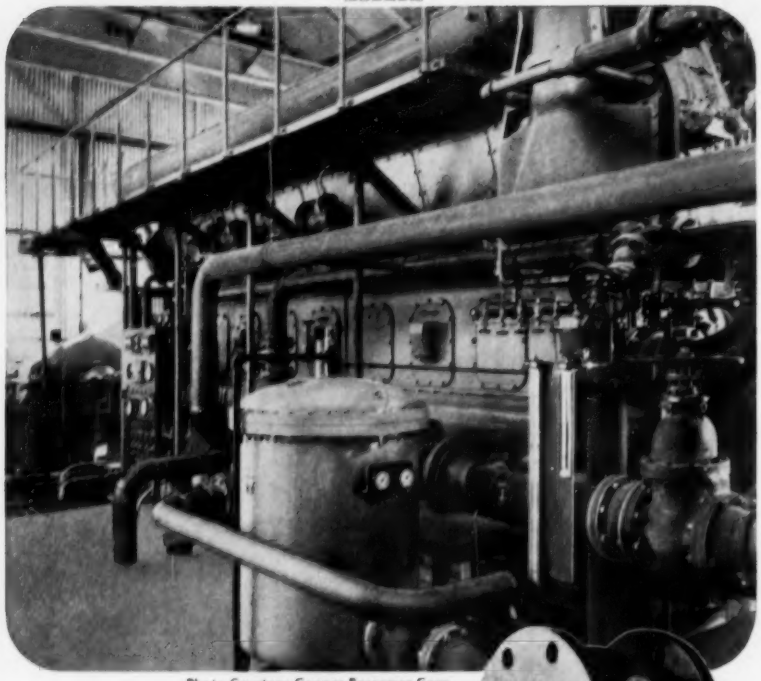
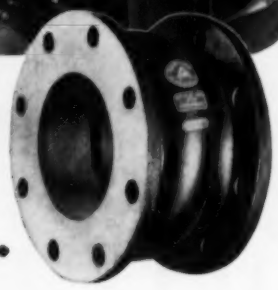


Photo Courtesy Cooper Bessemer Corp.



First Unattended Compressor Station Installs...

DEPENDABLE GARLOCK EXPANSION JOINTS Gulf Interstate Gas Company's Stanton, Kentucky station automatically pumps 400,000,000 cu. ft. of gas per day into northern markets. It's the first fully-automatic engine driven centrifugal compressor station...it's remote-controlled from Clementsville, Ky., 80 miles away. Obviously, the equipment supplied for such a project had to be the most reliable. Garlock neoprene-lined Expansion Joints were used on both oil and water lines to dampen vibration.

Rubber Expansion Joints are an important part of "the Garlock 2,000"...two thousand different styles of dependable gaskets, packings, and seals. It's the only complete line. It's one reason you get *unbiased* recommendations from your Garlock representative. Call him or write for Expansion Joint Bulletin AD-137.

THE GARLOCK PACKING COMPANY, Palmyra, New York

For Prompt Service, *contact one of our 30 sales offices and warehouses throughout the U. S. and Canada.*

GARLOCK

Packings, Gaskets, Oil Seals, Mechanical Seals, Rubber Expansion Joints

RECENT TRADE LITERATURE

Continued

cover both individual, combined multiple gas vents, provide information to assist gas vent installers. *Metalbestos Div., William Wallace Co., Dept. HPAC, Belmont, Calif.*

▸ *HEAT EXCHANGER* — Bulletin 132 illustrates, explains functions of sectional "Aero" heat exchanger to provide cooling of liquids in industrial plants independent of large supply of cooling water. *Niagara Blower Co., Dept. HPAC,* 405 *Lexington Ave., New York* 17.

▸ *HEATERS* — Literature contains photographs, tables of specifications, dimensional drawings for company's line of gas, light oil, heavy oil fired packaged air heaters. *Auto-Therm Mfg. Co., Dept. HPAC,* 6400 *E. Seven Mile Rd., Detroit* 34.

▸ *HOSE CLAMPS, TOOLS, FITTINGS* — Included in condensed catalog F-279-R2 are illustrations, descriptions of line of hose clamps, locking tools, fittings, accessories, also how-to-order information. *Punch-Lok Co., Dept. HPAC,* 321 *N. Justine St., Chicago* 7.

▸ *INSTRUMENT PANELS* — New 16 page product specification G71-7 describes completely tubed and wired, ready to "plug-in" standardized instrument panels. Panels available in six designs. *Bailey Meter Co., Dept. HPAC,* 1050 *Ivanhoe Rd., Cleveland* 10.

▸ *INSULATION* — Four page brochure describes "Gilsulate" insulation for hot underground pipes. Discusses problems of underground pipe insulation, explains how product's properties overcome them. On-the-job photographs, brief technical data included. *American Gilsonite Co., Dept. HPAC,* 134 *W. Broadway, Salt Lake City* 1.

▸ *LIQUID ROSIN FLUX* — New 2 page technical bulletin No. 2 gives

Write your own specifications:

VOLATILITY
B.T.U's
SIZE
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MOISTURE
SULPHUR
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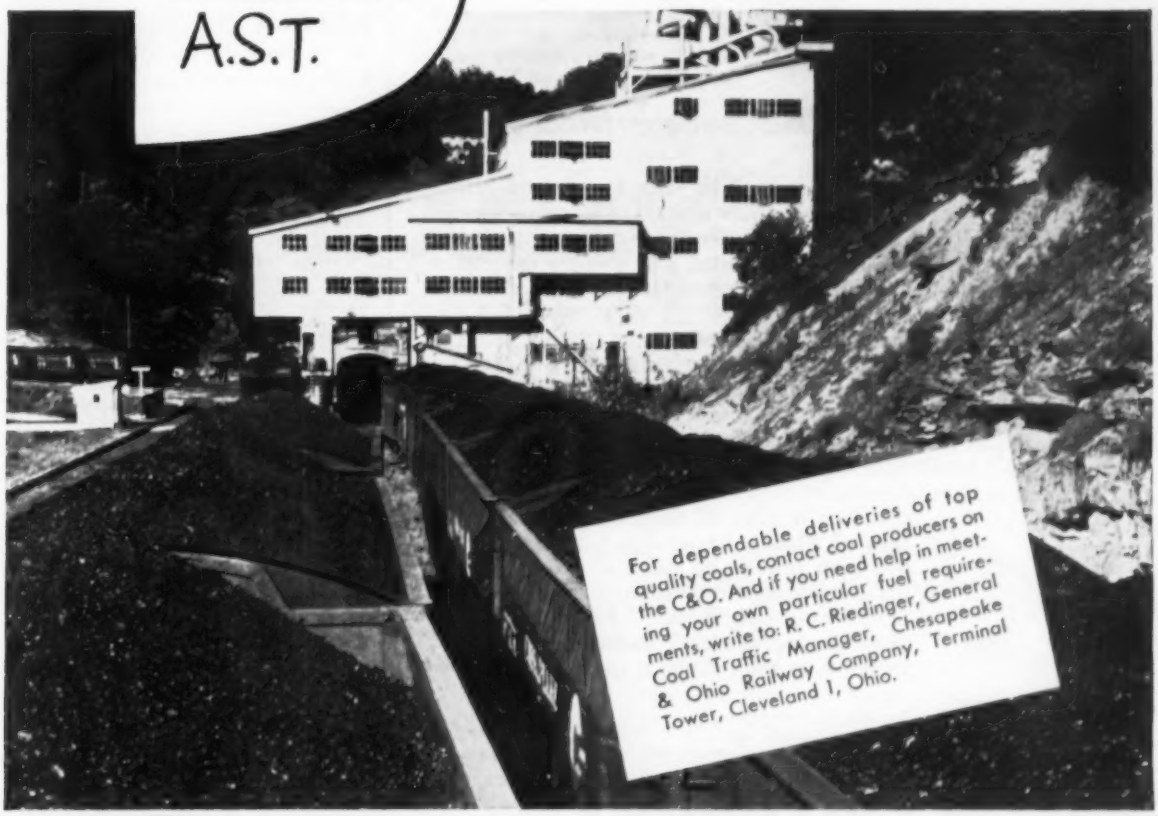
. . . the modern, efficient mines on the C&O can produce just what you want.

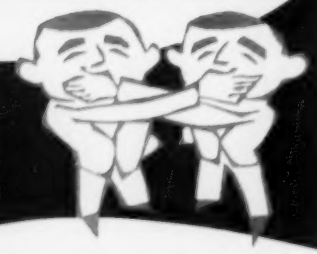

For dependable deliveries of top quality coals, contact coal producers on the C&O. And if you need help in meeting your own particular fuel requirements, write to: R. C. Riedinger, General Coal Traffic Manager, Chesapeake & Ohio Railway Company, Terminal Tower, Cleveland 1, Ohio.

Chesapeake and Ohio Railway

WORLD'S LARGEST CARRIER OF BITUMINOUS COAL

FLEXON
EXPANSION COMPENSATORS

"SILENT PARTNERS" in Heating System Expansion Control



Model H, High Pressure Type— for pressures to 150 psig, temperatures to 750°F. Handles total motion to 1¾" (1½" compression, ¼" extension). Available with all commonly used fittings. Pipe sizes: ¾" through 3".

Model L, Low Pressure Type— for pressures to 40 psig, temperatures to 250°F. Handles total motion to ⅝" (½" compression, ⅛" extension). Available with all commonly used fittings. Sizes: ¾" through 2".

Install these two "silent partners" in your steam and hot water heating systems and the whole operation becomes very "hush-hush". The objectionable noise of pipe creeping caused by uncontrolled expansion is eliminated and you are assured of maintenance-free leakproof service—for the life of the piping system.

Especially designed and engineered for the modern trend to narrow wall construction, they replace less effective or obsolete methods of expansion compensation such as slip joints, swing joints, and pipe loops and bends.

Flexonics Corporation manufactures a low pressure compensator for horizontal lines—a high pressure type for both risers and horizontal runs.

The quality of design and construction of Flexon Expansion Compensators has been proven by years of actual operating experience and exhaustive laboratory tests. You can install "FLEXON" in your piping systems knowing they do much more than "keep it quiet."

For detailed information, write for Bulletin 151.

FLEXON® QUALITY
proved in service and backed by over 54 years manufacturing experience

EC-24

Flexonics *Corporation*
FLEXON BELLOWS DIVISION
1391 S. THIRD AVENUE, MAYWOOD, ILLINOIS
FORMERLY CHICAGO METAL HOSE CORPORATION

Manufacturers of flexible metal hose and conduit, expansion joints, metallic bellows and assemblies of these components.
In Canada: Flexonics Corporation of Canada, Ltd., Brampton, Ontario

RECENT TRADE LITERATURE
Continued

description, uses, properties, methods of application of company's "No. 346" liquid rosin flux (activated). Graph showing concentration-density relationship of flux to "No. 446" flux thinner included. *Alpha Plastics, Inc., Dept. HPAC, 56 Water St., Jersey City.*

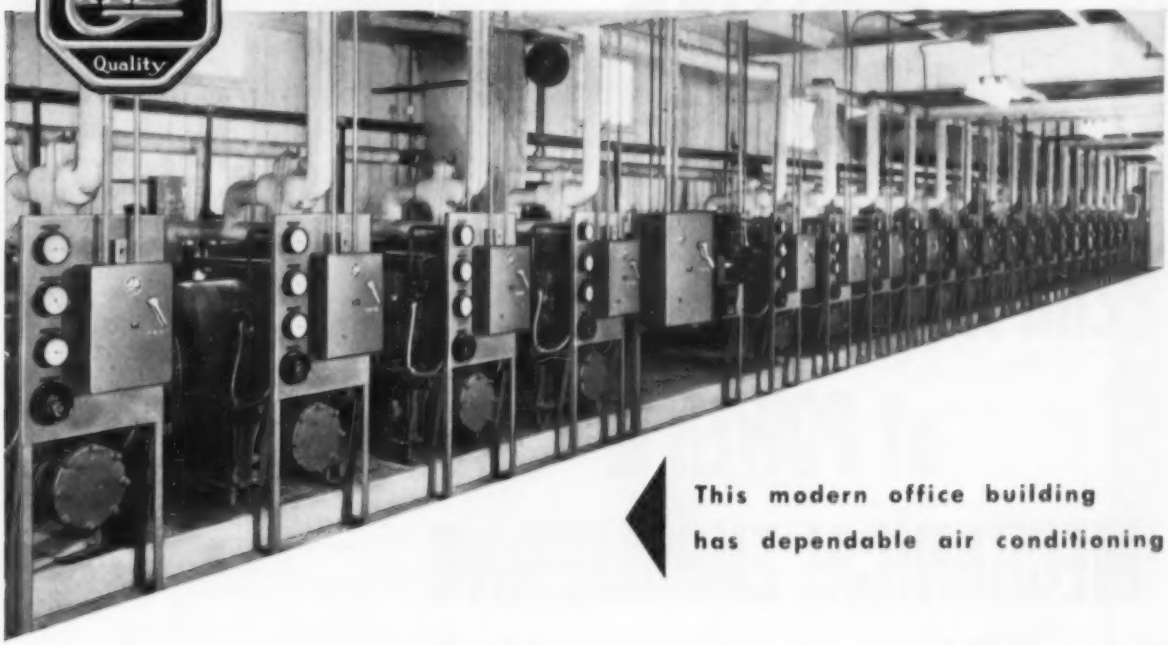
▶ *METERS, CONTROLS* — Measuring, transmitting, receiving recording, indicating instruments and control components for power, process applications described in new 8 page bulletin G15-1. Includes detailed literature reference for each product. *Bailey Meter Co., Dept. HPAC, 1051 Ivanhoe Rd., Cleveland 10.*

▶ *MOTORS*—New consolidated line of "industrial quality" fractional horsepower 48 and 56 frame electric motors detailed in 12 page brochure. Units in capacities 1/20 to 1 hp. Literature details features of open and totally enclosed motor construction. Tables of ratings and dimensions, dimensional drawings included. *Century Electric Co., Dept. HPAC, 1806 Pine St., St. Louis 3.*

▶ *MOTORS* — "AL-4" fractional horsepower electric motor, designed for more horsepower in smaller unit, detailed in new 4 page brochure. Included is description of features, applications of "MicroMotor." Cutaway photograph and illustration of "Tri-Flux" design included. *Redmond Co., Inc., Dept. HPAC, Owosso, Mich.*

▶ *NYLON PRESSURE TUBING* — Literature details "nylaflow" nylon pressure tubing. Technical bulletins discuss: what tubing is; how to determine its bursting strength; comparison with other tubings; suggested fittings; cutting and flaring; how it teams with hydraulics; how it solves operating and maintenance problems on metalworking equipment; how it reduces cost in water system installation. *Polymer Corp. of*

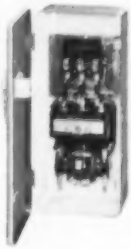
THE SIGN OF QUALITY MOTOR CONTROL



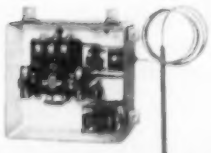
This modern office building has dependable air conditioning

TYPICAL ALLEN-BRADLEY CONTROL UNITS FOR AIR CONDITIONING & REFRIGERATION

Bulletin 712 Combination Starter with new visible contact disconnect switch.



Temperature Control Panel



ALLEN-BRADLEY
SOLENOID MOTOR CONTROL
QUALITY

. . . all compressors are equipped with

ALLEN-BRADLEY

TROUBLE FREE MOTOR CONTROLS

The importance of "trouble free" operation is well recognized by air-conditioning and refrigeration equipment manufacturers. This is illustrated in the above picture which shows 20 of 41 air-conditioning compressors installed in a new office building . . . all equipped with Allen-Bradley controls.

The basic simplicity of Allen-Bradley solenoid starters is the reason for their outstanding reliability . . . there is only ONE moving part. No bearings or gimmicks to corrode and stick . . . no jumpers to break. The double break, cadmium silver alloy contacts never need cleaning, filing, or dressing . . . maintenance down time is eliminated, and so are "service calls." Dependable overload relays that maintain their accuracy indefinitely protect motors against burnout.

Specify Allen-Bradley "Quality" motor control . . . you will never have reason to regret your decision. Please write for your copy of the latest Allen-Bradley Handy Catalog, the 132-page guide to trouble free a-c and d-c motor control.

Allen-Bradley Co.
1335 S. First St., Milwaukee 4, Wis.
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Best Port-of-Call for POWER FACTS:

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If your interest is in the efficient production—or use—of POWER of any kind, you should make a date to see the Power Show in November!

This bigger, better exposition features hundreds of informative exhibits of new equipment, new techniques, new applications . . . and ATOMIC ENERGY is covered in a special section!

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RECENT TRADE LITERATURE
Continued

Pennsylvania, Dept. HPAC, Reading, Pa.

▸ *OIL HEATING BOILER* — "Premier" oil heating boiler for small commercial installations described in form 831. Cutaway illustrations, diagrams detail special features. Drawings explain extended-fin heating surface, wet base construction, vertical gas passages. *National-U.S. Radiator Corp., Dept. HPAC, Johnstown, Pa.*

▸ *OIL PREHEATERS* — Detailed information on company's double-transfer "Safe Guard" oil preheaters contained in new bulletin. Capacities, dimensions, diagrams for both six-pass and two-pass units included. *Alstrom Corp., Dept. HPAC, 790 E. 176th St., New York 60.*

▸ *PACKAGED WATER CHILLERS* — New 16 page bulletin 5925 describes "Type CC" packaged water chillers for air conditioning or industrial cooling applications. Details mechanical specifications for subassemblies and components in units. Outlines advantages. *American Blower Corp., Dept. HPAC, Detroit 32.*

▸ *PIPE BENDERS* — *How to bend rigid or thinwall conduit easily and accurately* is title of 4 page bulletin 556. Literature illustrates line of pipe benders featuring calibrated degree scale designed for making accurate repeat bends with ease. *Gustave Lidseen, Inc., Dept. HPAC, 1000 First St., Hayesville, N.C.*

▸ *POWER PIPE PUSHING* — Manual used in conjunction with company's "Speed-Thru" pipe pusher. Also illustrates, describes methods which can be used in connection with most any type of pipe pusher, whether hand or power operated. Designed to aid persons concerned with underground pipe, conduit installations.

New *SKIL* Shear Sweeps Field in Actual Comparison Tests!

SKIL Model 231 Wins 5 Trials Out of 5
Outperforms, Outproduces All Others

Actual tests prove what many sheet metal men are learning for themselves. The new SKIL 231 Shear is far superior to all others on the market. These tests show the speed, power, and control that are making the SKIL Shear so popular on every job . . . in every shop.

Here are actual results of impartial tests of the SKIL Model 231 Shear and competitive brands. Shown are performance figures for SKIL, Brand A, and Brand B.

Test 1:

25" Trial Cut of 12 Gauge Metal

Model 231	9.2 seconds
Brand A	15.3 seconds
Brand B	12.0 seconds

Test 2:

Cutting Right and Left Hand Circles

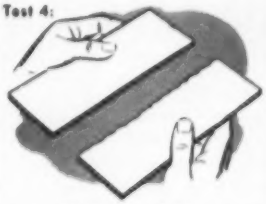
Model 231	22.0 seconds
Brand A	24.0 seconds
Brand B	22.2 seconds

Test 3:

Small Diameter of Circular Cuts

Model 231	1½"
Brand A	2"
Brand B	(right hand) 2½" (left hand) 4½"

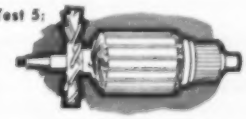
Test 4:



Cleanness of Cuts

Model 231	Excellent
Brand A	Good
Brand B	Poor

Test 5:



Power and Performance

SKIL 40% more powerful than Brand A and 33⅓% more powerful than Brand B.

SKIL SHEAR 231—Best All-Around

The results show that the 231 is the best all-around Shear on the market today. Faster, easier handling, more powerful! Features like the Contour Grip Handle at the rear of the tool make it a favorite with workmen who have tough cutting to do. Improved foot design keeps maintenance costs down for job superintendents. This is the shear you need in *your* shop. The SKIL Model 231.

FREE! Mail the Coupon for a Demonstration and a FREE Trial of the SKIL SHEAR Model 231! See How Much Faster, Easier-Handling this New SKIL Shear is on your Toughest Cutting Job!

Contact Your SKIL Distributor—or Your Nearby Factory Branch—for Complete Information.

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PORTABLE TOOLS

Made only by SKIL Corporation
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Factory Branches in All Leading Cities

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5033 Elston Avenue, Chicago 30, Illinois

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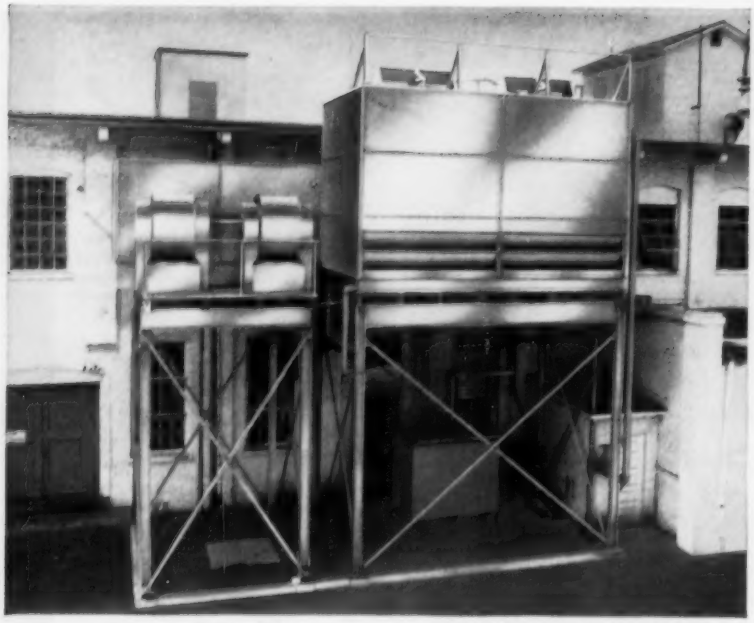

Binks cooling towers—a youngster and an old-timer—work side by side at Vick Chemical Company, Greensboro, N. C. Tower at left was installed 17 years after tower at right which still serves faithfully.

Vick Chemical Company...

Supplements 1936 installation with second Binks cooling tower

17 years after their first Binks cooling tower installation, Vick Chemical needed additional cooling capacity. The dependable performance of their existing Type "K" mechanical draft tower was a decisive factor in selecting a second Binks cooling tower installation.

New Binks Series 3-B tower cross-connected with first tower

The new Binks Series 3-B cooling tower is used for condensing process steam. The old tower is presently used for the air conditioning system. Each installation is independent of the other but cross-connected so that each may stand by for the other in cases of emergency or during periods of maintenance.

Built-in long life

Case histories proving the dependable performance of Binks cooling towers are not uncommon. All parts are built to rigid specifications which insure long life. And, Binks cooling towers are designed for easy periodic maintenance, a factor appreciated by those who must do the work.

For full information

on Binks complete line of mechanical and natural draft cooling towers, write directly to the address below. Binks engineers will gladly study your needs and help you select the correct tower for your requirements.

669

Binks
EVERYTHING FOR WATER COOLING

A COMPLETE LINE OF NATURAL DRAFT AND MECHANICAL DRAFT COOLING TOWERS AND INDUSTRIAL SPRAY NOZZLES

Binks Manufacturing Company
3118-38 Carroll Ave., Chicago 12, Ill.

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RECENT TRADE LITERATURE

Continued

Mercury Hydraulics, Inc., Dept. HPAC, 2440 Blake St., Denver 5.

▸ *POWER ROOF EXHAUSTERS* — Buyers' guide for evaluating power roof exhausters gives explanations on 11 cardinal points to be considered in purchase of such equipment. *Gallaher Co., Dept. HPAC, 4108 Dodge St., Omaha.*

▸ *PROCESS PUMPS* — Bulletin 111-ZA describes new line of single-, double-stage turbine type process pumps. Units designed to handle liquefied petroleum, gases, refrigerants, other light and nonviscous liquids. *Aurora Pump Div., New York Air Brake Co., Dept. HPAC, Aurora, Ill.*

▸ *PROPELLER FANS* — Economy features of company's propeller fans over more costly ventilating systems described in bulletin 800. Cited features of belt and direct drive models are low initial and operating costs, quietness, high efficiency. Units operate horizontally, vertically. *Herman Nelson Products, American Air Filter Co., Inc., Dept. HPAC, Louisville.*

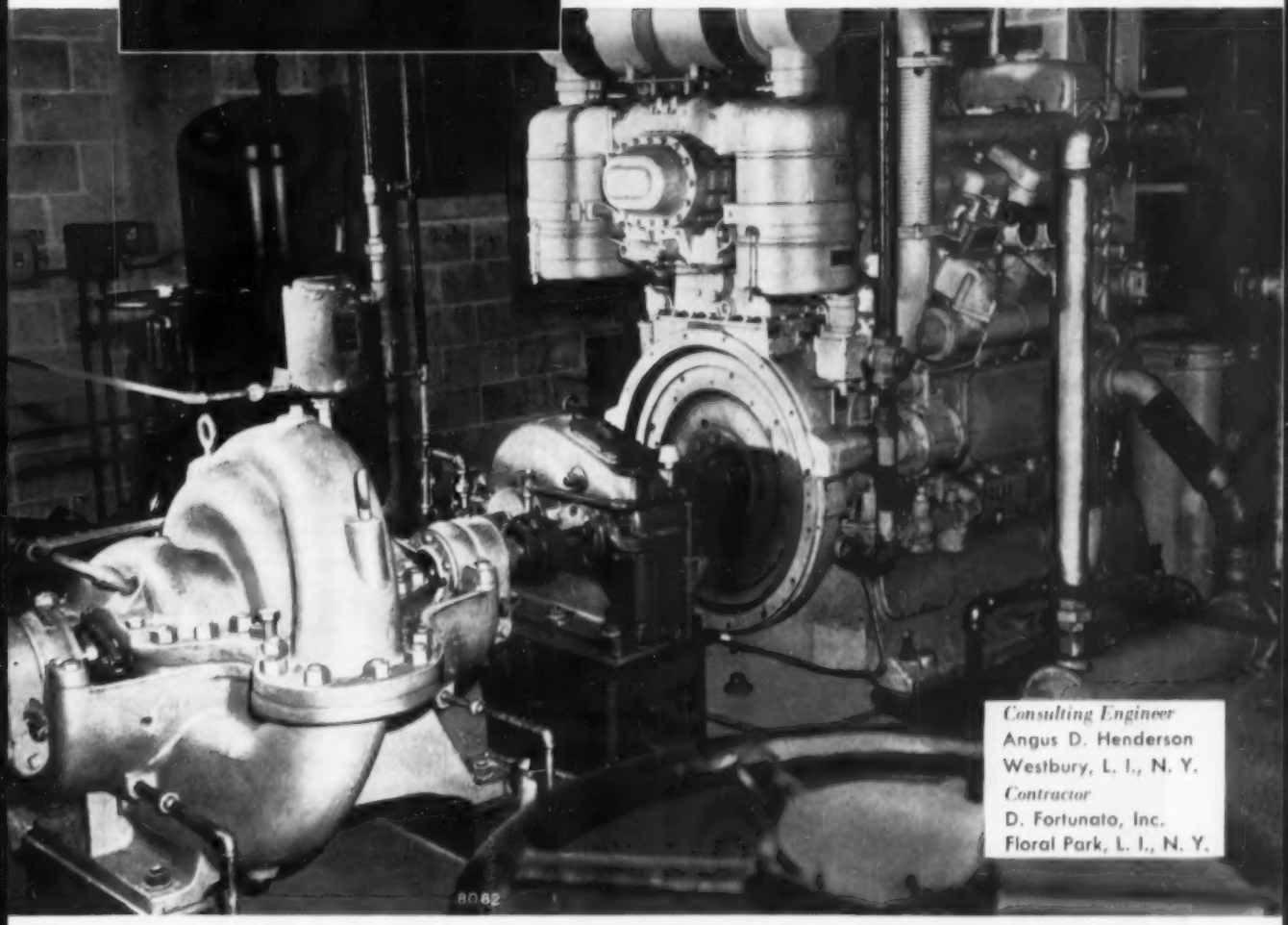
▸ *PSYCHROMETRIC CHARTS* — Company offers pad of psychrometric charts free for the writing. Recommended for architects, engineers, heating contractors figuring heating, cooling, air conditioning problems. *Young Radiator Co., Dept. HPAC, Racine, Wis.*

▸ *PUMPING* — New engineering release on *Pressure Effects of Pump Location Relative to the Compression Tank* offers answer to why certain large circulating water systems have exhibited such problems as unheatable top floor circuits, noisy, cavitating pumps, unventable air-bound radiation. *Bell & Gossett Co., Dept. HPAC, Morton Grove, Ill.*

▸ *RECORDING, CONTROLLING* — New approach to recording, indicat-

DE LAVAL
TWO-STAGE CENTRIFUGAL PUMPS

boost pressure at peak loads in Port Washington, New York



Consulting Engineer
Angus D. Henderson
Westbury, L. I., N. Y.
Contractor
D. Fortunato, Inc.
Floral Park, L. I., N. Y.

This De Laval two-stage horizontal split-case pump is one of a pair used to boost pressure during peak hours in the Port Washington, New York water works. Taking water from a large underground storage tank, these De Laval units maintain pressure throughout the system. The dependable centrifugal pumps are powered by Caterpillar diesels with speed increasers; they deliver 1500 gpm at 400 feet tdh with 15 feet lift requiring 185 bhp.

De Laval 2IS-2KS pumps are designed with • back-to-back impellers for balanced hydraulic thrust • easily replaceable threaded impeller wearing rings • long-life labyrinth case rings • ring-oiled ball bearings—plus ten other important design features. They are available in sizes from 2 inch to 8 inch discharge, for capacities to 3000 gpm and heads to 750 feet. ***Write for Bulletin 1501 giving complete data.***

Readers of this publication can obtain the De Laval Engineering Handbook (Regular Price $3.00) for one dollar. Its 336 pages contain mathematical, mechanical, fluid and other data on turbines, pumps, compressors and reduction gearing. Write for your copy.

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DE LAVAL STEAM TURBINE COMPANY

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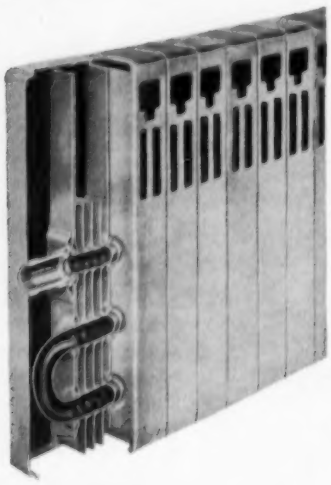
DL 557

SHAW PANEL RADIATORS

designed for proper distribution of boiler heat in each room



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RECENT TRADE LITERATURE

Continued

ing, controlling instruments required in industrial processing discussed in four page bulletin No. F-403. Described are systems designed for simplicity, flexibility. *Fielden Instrument Div., Robertshaw-Fulton Controls Co., Dept. HPAC, 2920 N. Fourth St., Philadelphia 33.*

▸ *SERVICE COCKS, METER AND AIR COCKS* — New 12 page bulletin V-605 covers line of service cocks, meter and air cocks for moderate pressure services such as gas, water, utility services. Units described are also recommended by company for use in number of low pressure industrial applications. *Meter and Valve Div., Rockwell Mfg. Co., Dept. HPAC, 400 N. Lexington Ave., Pittsburgh 8.*

▸ *SET SCREWS* — New 28 page catalog No. 21 lists, describes standard set screws and special types designed to meet conditions of vibration, close precision setting, resistance to tampering, chemicals or heat, etc. *Set Screw & Mfg. Co., Dept. HPAC, Bartlett, Ill.*

▸ *SILVER SOLDERING* — New 2 page technical bulletin No. 3 on silver bearing soft solders discusses silver scavenging, alloy selection, applications, available alloys. Graph designed to help determine proper alloy for use in particular application also included. *Alpha Metals, Inc., Dept. HPAC, 56 Water St., Jersey City.*

▸ *SMOKE, COMBUSTION CONTROLLER* — Data sheet 10.14-2a describes Brooke Engineering Co., Inc., smoke density system using Brown "ElectroniK" recorders. Cited features are clean lenses and long, dependable service life. *Minneapolis-Honeywell Regulator Co., Dept. HPAC, Wayne and Windrim Aves., Philadelphia 44.*

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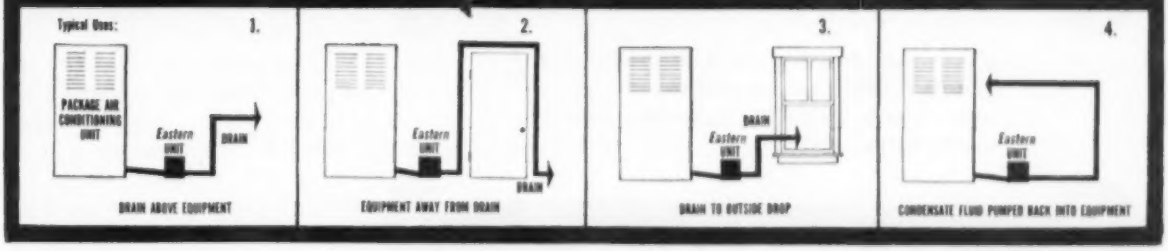

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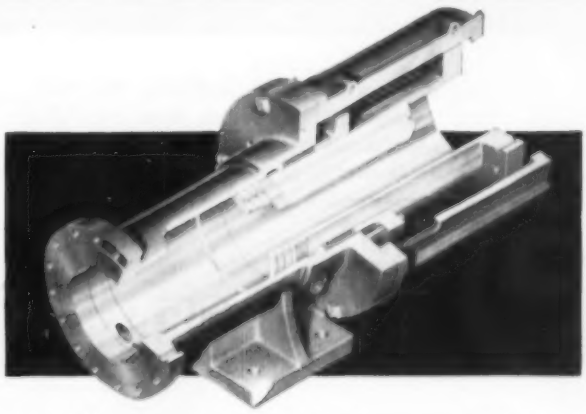
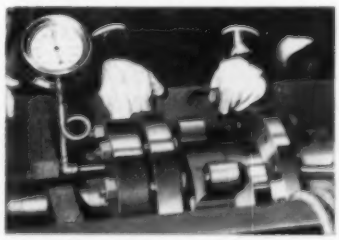


PROOF FROM THE PITTSBURGH TESTING LABORATORY



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RECENT TRADE LITERATURE
Continued

▸ *SOLDERING FLUXES* — New 4 page folder, *The Right Flux for the Right Job,* designed to simplify proper selection of corrosive, non-corrosive fluxes for all metal joining. *Anchor Metal Co., Inc., Dept. HPAC, 244 Boerum St., Brooklyn 6.*

▸ *SOLENOID VALVES* — Bulletin describes, illustrates additions to line of bronze, stainless steel solenoid valves. Included in new models are "Type AD" bronze valves from ½ to 1 in., "Type KD" stainless steel units in sizes ½ to 1 in., "Type GD" stainless steel model in ⅜ in. size. *J. D. Gould Co., Dept. HPAC, 730 E. Washington St., Indianapolis 2.*

▸ *SPRAYABLE COATING* — New 4 page bulletin SP-1 describes "Unichrome Super 5300" sprayable "Plastisol" coating, tells how it can be sprayed in coating to 60 mils thick in single application. Formulated to protect tanks, chemical vessels, similar equipment against range of acids, alkalis, salt solutions, complex chemical compounds. *Metal & Thermit Corp., Dept. HPAC, Rahway, N.J.*

▸ *STEAM ANALYZER* — Bulletin 2082-A explains construction features, performance characteristics of company's "Larson-Lane" steam and condensate analyzer. *Dearborn Chemical Co., Dept. HPAC, Merchandise Mart Plaza, Chicago 54.*

▸ *STEAM COILS* — New 12 page catalog on "Recold" steam coils includes information on standard, heavy duty, low capacity, nonfreeze types. Tables show final temperature and Btu capacity per sq ft of face area at steam pressures 2, 5, 15, 30 psig with face velocity 400 to 1200 fpm and entering air temperature —20 to 70 F. *Refrigeration Engineering Inc., Dept. HPAC, 7250 E. Slauson Ave., Los Angeles 22.*

▸ *STORAGE WATER HEATERS* — Company's standard lines of com-

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RECENT TRADE LITERATURE

Continued

mercial and industrial storage water heaters covered in catalog 19. Selection tables of capacities and weights, dimensions, hot water fixture capacities, material thicknesses, heating elements, construction details provided. *Patterson-Kelley Co., Inc., Dept. HPAC, 501 Fulton St., East Stroudsburg, Pa.*

▸ *SUBMERSIBLE TURBINE PUMPS* — New 6 page bulletin No. 6710-20-A gives revised ratings and sizes, new performance curves on submersible turbine pumps for wells 4 to 6 in. in diameter. Literature includes performance curves indicating efficiency, construction features, installation details, accessories. *Deming Co., Dept. HPAC, Salem, Ohio.*

▸ *TEMPERATURE CONTROL* — Warm air "zone" temperature control discussed in booklets SA2667 and SA2820-1. Former designed especially for sheet metal worker zone theories, tells when zoning should be used. Electrical circuit diagrams, installing instructions, checkout procedures for various zoning methods in latter, which is designed for installer-electrician serviceman. *Minneapolis-Honeywell Regulator Co., Dept. HPAC, 2641 Fourth Ave., S., Minneapolis 8.*

▸ *TESTING CHAMBER* — "TR" chamber especially designed for accurate, controlled high and low temperature and relative humidity testing described in 4 page folder. Literature contains details regarding applications, performance, construction, specification data. *Tenney Engineering, Inc., Dept. HPAC, 1090 Springfield Rd., Union, N.J.*

▸ *THERMOSTATIC CONTROL VALVES* — Brief descriptions, engineering data concerning line of steam temperature regulators, water controllers, hospital and photographic temperature control assemblies, tempering valves, other products

RECENT TRADE LITERATURE

Continued

contained in 8 page condensed catalog No. C-7. *Lawler Automatic Controls, Inc., Dept. HPAC, Mt. Vernon, N. Y.*

▸ *TUBE EXPANDERS* — New 119 page catalog No. 88 contains detailed information on tube expanders, associated tools used for tube rolling. Designed to aid engineers, superintendents responsible for maintenance or manufacture of boilers, condensers, evaporators, miscellaneous heat exchangers. *Thomas C. Wilson, Inc., Dept. HPAC,* 21-11 *44th Ave., Long Island City* 1, *N.Y.*

▸ *TUBING, PIPE, FITTINGS, FLANGES* — Folder TDC-186 is designed to aid engineers, buyers, others involved with problem of determining proper specifications to apply to various carbon, alloy and stainless steel tubing, pipe, seamless welding fittings, flanges. *Tubular Products Div., Babcock & Wilcox Co., Dept HPAC, Beaver Falls, Pa.*

▸ *UNIT VENTILATOR* — New 12 page catalog describes quietness features of "AUDIvent" auditorium unit ventilator designed for heating, ventilating, natural cooling of areas such as gymnasiums, cafeterias, auditoriums, libraries, churches, similar large capacity rooms. *Herman Nelson Unit Ventilator Products, American Air Filter Co., Inc., Dept. HPAC, Louisville.*

▸ *UNIT VENTILATORS* — Guide to advantages, selection of perimeter piping systems for forced hot water heating with classroom unit ventilators and convectors is 24 page engineering data supplement designed to aid consulting engineers. *Herman Nelson Unit Ventilator Products, Air Filter Co., Inc., Dept. HPAC, Louisville.*

▸ *WATER CONTROL* — *Automatic Pumping Cuts Water Costs* is 2 page reprint contained in 4 page folder

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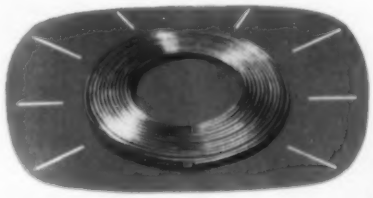

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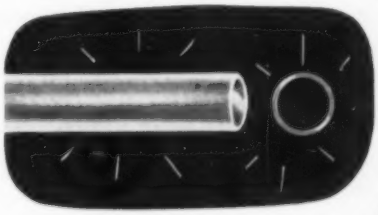

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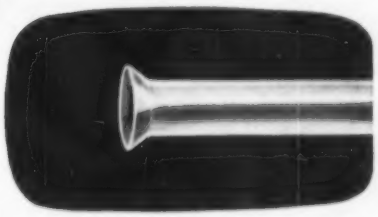

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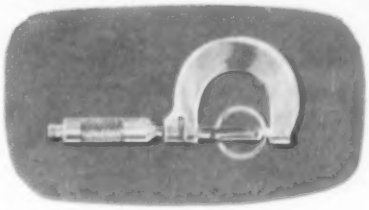

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RECENT TRADE LITERATURE

Continued

which tells how Park Ridge, Ill., a Chicago suburb, accomplished financial savings by changing from manual to "automatic" water control. *Automatic Control Co., Dept. HPAC, 995 University Ave., St. Paul 4.*

▸ *WEATHER CONTROLS* — Chart scheduling most suitable "outdoor" controls for use with different types of heating systems under varying conditions, requirements presented in bulletin No. N-756. Includes "guide specifications" in outline form, scheduled separately for various types of heating systems, requirements, etc. *Automatic Devices Co., Inc., Dept. HPAC, 714 Hillgrove Ave., Western Springs, Ill.*

▸ *WELDING* — New pocket sized 168 page *Welding Data Book* is designed as guide to stronger, faster welding. Contains suggestions for time and money savings, "how-to-weld" tips, diagrams showing torch settings and electrode manipulations, other information, says company. *Eutectic Welding Alloys Corp., Dept. HPAC, 40-40 172nd St., Flushing 58, New York.*

▸ *WELDING* — Bulletin 339 describes four function spot welder featuring company's new predetermined electronic welder control to cover a range of aircraft and other rigid welding specifications. Literature reveals various circuits employed with control. *Sciaky Bros., Inc., Dept. HPAC, 4915 W. 67th St., Chicago.*

▸ *WELDING HELMETS* — "S" line welding helmets, equipment described in bulletin No. 0303-4. Glass fiber face protectors, available in several models, designed to resist heat, moisture, rot. Literature also covers "Nitrometer" mask for face protection from splashing chemicals. *Mine Safety Appliances Co., Dept. HPAC, 210 N. Braddock Ave., Pittsburgh 8.* ⋕

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WHO'S WHAT . . .

(New personnel, promotions)

▸ *HARRY P. WATSON & ASSOCIATES*—Harry P. Watson, head of new mechanical engineering consultant firm. A. M. Emyanitoff is an associate.

▸ *AMERICAN AIR FILTER CO., INC.*—Robert W. Nelson, director of newly established administrative central staff; John Hellstrom, to direct administration of American Air Div. (Louisville operating division); James W. May, director of technical training.

▸ *CARRIER CORP.*—Everett P. Palmatier, manager of transportation equipment department; Dr. Dewey J. Sandell, director of research, succeeding Mr. Palmatier. Edward C. Lingenheld, Jr., has been appointed assistant sales promotion manager. For Cambridge Corp., a Carrier subsidiary, John M. Eagleson and James A. Graham are named vice presidents. Mr. Eagleson is in charge of manufacturing, while Mr. Graham is manager of sales.

▸ *ARMCO STEEL CORP.*—R. L. Gray, president. Mr. Gray succeeds W. W. Sebald, who has resigned that post, but will continue in an executive capacity as vice chairman of Armco's board of directors. Mr. Sebald also becomes chairman of the board's executive committee.

▸ *MINNEAPOLIS-HONEYWELL REGULATOR CO.*—O. B. Wilson, vice president of Brown Instrument Div. He will continue in his current post as general sales manager for the division.

▸ *WARNER ELECTRIC BRAKE & CLUTCH CO.*—Alonzo A. Neese, a director.

▸ *THERMO-FLEX CORP.*—Robert V. McCallister, vice president.

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WHO'S WHAT *Continued*

▸ *WORTHINGTON CORP.*—Walther H. Feldmann, a director. Mr. Feldmann is executive vice president of Worthington.

▸ *YORK DIV., BORG-WARNER CORP.*—Donald A. McCall, staff assistant in management training and educational services department of Borg-Warner. Mr. McCall is director of community relations for York.

▸ *NATIONAL ASSOCIATION OF POWER ENGINEERS*—J. Dudley Holmes, national vice president.

▸ *INTERNATIONAL NICKEL CO., INC.*—Dr. G. E. Zima, appointed to staff of company's Bayonne, N.J., research laboratory as research metallurgist; John S. Pettibone, member of corrosion section, also at Bayonne laboratory; Charles Schillmoller and Alden P. Edson, named to staffs of company's West Coast and New England technical field sections, respectively, development and research division.

▸ *CHASE BRASS & COPPER CO.*—Robert C. Smith, treasurer.

▸ *KICE METAL PRODUCTS CO.*—Jack W. Kice, to devote his full time to the company.

▸ *WESTINGHOUSE ELECTRIC CORP.*—New assignments in heat transfer apparatus department of steam division are: P. L. Fetzer, sales manager; M. A. Nelson, engineering manager; W. E. Rudloff, manufacturing manager. C. C. Franck has been named consulting engineer at the division.

▸ *PERFECTION INDUSTRIES, DIV. OF HUPP CORP.*—Carl W. Millsom, Jr., vice president of air conditioning and appliance sales; Donald G. Wright, general sales manager, contract sales.

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WHO'S WHAT *Continued*

▸ *DEERING AIR CONDITIONING CO.*—James W. Riley, president.

▸ *A. M. BYERS CO.*—Frank E. Farnan, assistant to vice president and acting chief executive officer; Theodore W. Crouch, advertising manager, succeeding Mr. Farnan.

▸ *PITTSBURGH PLATE GLASS CO.*—John K. Cochran, manager of production for Fiber Glass Div.

▸ *INLAND STEEL PRODUCTS CO.*—Norman D. Rice, vice president for manufacturing and engineering.

▸ *LIBBEY-OWENS-FORD GLASS CO.*—Donald J. Vild, technical service engineer.

▸ *TYPHOON AIR CONDITIONING CO.*—Roy Scantlebury, vice president of newly formed Hupp International. All export activities of the divisions of Hupp Corp., of which Typhoon is one, will eventually be channeled through Hupp International, the central export department.

▸ *COMBUSTION ENGINEERING, INC.*—Robert M. Hatfield, general sales manager. Mr. Hatfield is succeeded as manager of the company's western division by Frank M. Bader.

▸ *AMERICAN RADIATOR & STANDARD SANITARY CORP.*—Louis G. Shenk, Jr., manager of boiler and radiator products for company's plumbing and heating division.

▸ *POWERS REGULATOR CO.*—James C. Tobin, central division construction manager.

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Be *sure* you know about SYNCRO/FLAME whenever you have a job that calls for a good forced-draft gas burner! This one is designed for boilers in the range of 10 to 150 h.p. It comes in seven sizes, of different capacities, and it is outstanding for unusual and valuable features. Among them are . . .

NON-PULSATING FLAME EXPLOSION-FREE CIRCUIT

Adept engineering has achieved a flame that positively does *not pulsate* on starting or stopping, thus completely removing a common objection. Also, a new control circuit virtually eliminates *any* chance of explosion, even under conditions of bad misadjustment. Circuits are also provided for pre-purge, post-purge, and graduated light-off. *Certainly*—a *great* power gas burner!

WRITE FOR LITERATURE

Write today for circular describing all features and giving full specifications. Ask for Bulletin 553.

MANUFACTURERS OF OIL AND GAS AND OIL/GAS BURNERS

SYNCHRONOUS FLAME, INC.

WALWORTH • WISCONSIN

WHO'S WHAT

Continued

▸ *TRANE CO.*—William D. Graham, Jr., promoted and transferred to the company's home office for specialized assignment. Formerly manager of the firm's Greensboro, N.C., office, he is succeeded there by E. A. Stroupe, Jr. Gerald Van Steenbergh, who is manager of government relations for Trane, has been appointed to the Department of Commerce Industry Advisory Committee for Air Conditioning, Commercial and Industrial Refrigeration.

▸ *ANISITE CO.*—J. E. Stone, director of sales.

▸ *GAS APPLIANCE MANUFACTURERS ASSOCIATION*—For relief valve division: A. F. Craver, manager of Patrol Valve Co., vice chairman; E. M. Garrett, Welsbach Corp., executive committee member.

▸ *FLEXIBLE TUBING CORP.*—Ernest W. Bush, general foreman in charge of all manufacturing operations.

▸ *L.O.F GLASS FIBERS CO.*—Herbert A. Fox, director of future planning division; Richard K. Trask, manager of building products sales; Don McAnally, manager of distributor sales.

▸ *JONES & LAUGHLIN STEEL CORP.*—Adm. Ben Moreell, to be recipient of John Fritz Medal. The award, which is sponsored jointly by the American Society of Civil Engineers, the American Institute of Mining, Metallurgical and Petroleum Engineers, the American Society of Mechanical Engineers and the American Institute of Electrical Engineers, is presented for distinguished services in peace and war. Adm. Moreell is chairman of the board of Jones & Laughlin and, in World War II, was organizer and commander of the Navy's "Seabees."

▸ *REFRIGERATION TRADE ASSOCIATION OF AMERICA*—L. L. Carter, president; R. H. Packett, executive secretary.

▸ *WALTER KIDDE CONSTRUCTORS, INC.*—William Collins, a director of Walter Kidde & Co., Inc.

▸ *GENERAL ELECTRIC CO.*—Dr. A. Eugene Schubert, manager of chemical development department.

▸ *ANSUL CHEMICAL CO.*—Edward A. Beacham, senior engineer in new products division, refrigeration sales development.

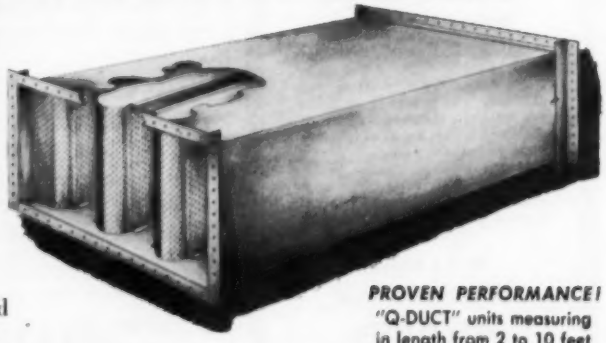
▸ *PARKER APPLIANCE CO.*—R. D. Beatty, Jr., application engineer for Tube & Hose Fittings Div.

IAC offers packaged

"STANDARDIZED SILENCING"

with Q-DUCT

The Silencing System
That Quiets Air-Conditioning
and Ventilating Systems
. . . IN THE DESIGN STAGE!



PROVEN PERFORMANCE!
"Q-DUCT" units measuring in length from 2 to 10 feet provide as much noise control as a conventional lined duct measuring from 30 to 100 feet long!

Packaged *Q-DUCT* units, *standardized* for easy installation, are available to eliminate duct noises from existing installations, or can be fitted into the system during the design stage!

Made in *148* sizes to meet every dimension and performance, *Q-DUCT* units take the guess-work out of the acoustic design of air-conditioning and ventilating systems.

The attenuation and pressure drop data of every *Q-DUCT* unit, having been determined by actual controlled measurements, are readily available from handy data sheets!

Write on business letterhead for Q-Duct catalog and complete data!

INDUSTRIAL ACOUSTICS COMPANY, INC.
"Specialists in Noise and Pulsation Control"
341 Jackson Avenue, New York 54, N.Y. Tel: CYpress 2-0180

WHO'S WHAT

Continued

▸ *ROBERTSHAW-FULTON CONTROLS CO.*—Harold W. Rice, director of West Coast research and development laboratory; George L. Leupold, assistant general sales manager of Fulton Sylphon Div.

▸ *BRYANT DIV., CARRIER CORP.*—Roger L. Black, appointed to development engineering staff.

▸ *CHASE BRASS & COPPER CO.*—Allan R. Armstrong, John J. Vreeland and Herman Kremer, staff managers of tube sales, sheet and strip sales, and rod and wire sales, respectively. Formerly district manager at Charlotte, Mr. Kremer is being replaced there by Thomas E. Cox.

▸ *CHARLES SIMKIN & SONS, INC.*—Charles E. Hull, assistant vice president to head company's newly created sales division.

▸ *WALWORTH CO.*—Vernen A. Tredinnick, assistant vice president in charge of inventory planning and control.

▸ *RUSSELL, BURDSALL & WARD BOLT AND NUT CO.*—James M. Dill, Jr., assistant to vice president-sales; Ward K. Jones, assistant office sales manager.

▸ *ALLIS-CHALMERS MFG. CO.*—H. R. Godfrey, Jr., assistant to the general manager of company's general products division.

▸ *DRAVO CORP.*—William J. Moreland, Jr., controller of company's machinery division.

▸ *TUTTLE & BAILEY DIV. OF ALLIED THERMAL CORP.*—James H. Faller, manager of Philadelphia office and warehouse.

▸ *COLEMAN CO., INC.*—Renne G. Rankin, field sales manager for "Blend-Air" heating and air conditioning division. He succeeds Hascal Simmons, appointed manager of company's branch sales office in Kansas City, Mo.

▸ *HOOKER ELECTROCHEMICAL CO.*—Henry J. Bartels, Dudley P. Fernandes and Kenneth Tracey, job leaders in company's process study department.

▸ *McGILL MFG. CO., INC.*—James C. McGill, manager of distributor sales.

Incredible Performance by "Z"crete® for Boston's New Steam-heated Highway!

This highway uses the world's largest snow-melting system in 14 approach ramps. Snow melting is accomplished with Z-Crete insulated pipes carrying steam at 125 psi from manholes of the Boston Edison Company to pump houses at strategic points along the highway.

Z-Crete insulated underground pipes deliver enough steam to melt an inch of snow in MINUTES

Z-Crete does a better, monolithic job of insulating any underground heating system. Lay pipes. Then insulate. It's easier because the structural concrete base pad provides better working conditions. Pipes can be welded on or below grade with no special handling. Any size, number or arrangement of pipes can be placed in one conduit. Mail coupon for booklet.

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Send free Z-Crete booklet and name of nearest applicator to:

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City ..... *Zone* ..... *State* .....

WHO'S WHAT

Continued

▸ *BURNS AND ROE, INC.*—Dr. Seymour Baron, technical director of company's newly created chemical and nuclear section.

▸ *NORRIS-THERMADOR CORP.*—Stuart S. Power, manager of evaporative cooler sales.

▸ *STEWART-WARNER CORP.*—W. D. Lannin, sales manager, commercial products, South Wind Div.

▸ *COPPER & BRASS RESEARCH ASSOCIATION*—Raymond J. Brown, West Coast field representative.

IN THE TERRITORIES . . .

(Recent sales appointments)

▸ *FISHER GOVERNOR CO.*—Jack M. Smither & Co., sales representative for Georgia, Florida, eastern Tennessee.

▸ *HAMMEL-DAHL CO.*—George Haynes Co., sales and service representative for western Missouri, northern Kansas.

▸ *HOOKER ELECTROCHEMICAL CO.*—Lewis J. Pentland, Evan E. Graham and Henry B. Puff, district sales managers for New York, California and Chicago, respectively, for company's Durez Plastics Div.

▸ *ROBINSON CLAY PRODUCT CO.*—George F. LeMay, resident manager of Hartford branch.

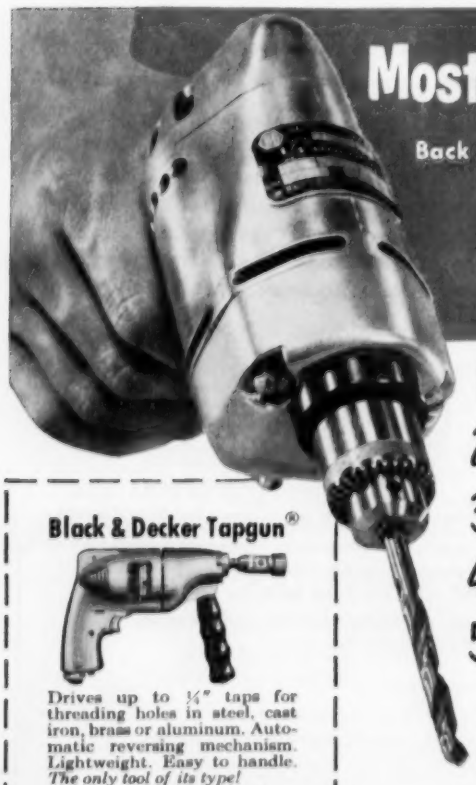
▸ *KRITZER RADIANT COILS, INC.*—Tennessee Heating Sales Co., representative for eastern Tennessee.

▸ *DEMING CO.*—Charles L. Bixler, district representative for Kansas, Nebraska, Iowa, part of Missouri.

▸ *CONNOR ENGINEERING CORP.*—Howard J. Waff, Jr., representative for the Carolinas, Georgia.

▸ *HUCK MFG. CO.*—Field engineers and the territories they will serve are: Donald V. Steele, western Missouri, Kansas, Iowa; William Messer, northern Illinois, northern Indiana, northwestern Ohio; Daniel D. Hicks, Florida.

▸ *PACIFIC STEEL BOILER DIV., NATIONAL-U.S. RADIATOR CORP.*—Chet Adams Co., to represent the division through its Richmond and Norfolk offices.



Most power per dollar of any drill!

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HOLGUN®

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1. Lowest-priced drill in its class!
2. Wear-resisting ball bearings.
3. Compact and lightweight; reduces operator fatigue.
4. No stalling under heavy loads.
5. Belongs to world's best-known drill line.

The new model Black & Decker ¼" Standard Holgun combines lightness and power. It's your ideal tool for a raft of drilling jobs. Powered by a B&D-built motor, it has stamina to spare. Rugged construction gives you years of trouble-free service.

See your B&D distributor today or write: THE BLACK & DECKER MFG. CO., Dept. 2810 Towson 4, Maryland.

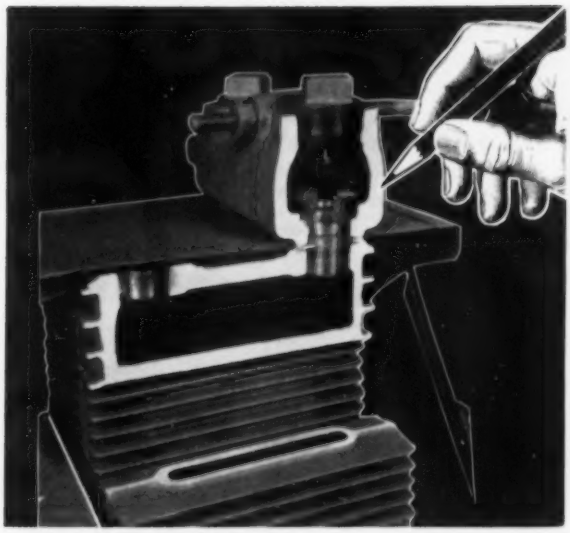
Black & Decker Tapgun®

Drives up to ¼" taps for threading holes in steel, cast iron, brass or aluminum. Automatic reversing mechanism. Lightweight. Easy to handle. *The only tool of its type!*

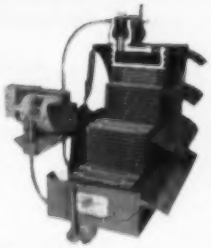
Look in the Yellow Pages under "Tools-Electric" for Nearest Distributor

B&D **Black & Decker®**

Portable electric tools—*power-built to last!*



GRID



CAST IRON CONSTRUCTION ends your UNIT HEATER maintenance problems!

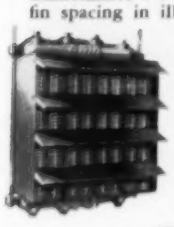
Corrosion in unit heaters—external, from contaminated air . . . internal, from electrolytic action ends—when your unit heaters are GRID cast iron construction. Here's why—GRID heating sections are made of high-test cast iron . . . *no external corrosion from acid or other fumes present in many plants.*

All metals in contact with steam are similar . . . no electrolytic action internally . . . *no internal corrosion.*

GRID construction ends your unit heater maintenance problems—because GRID will operate on steam pressures up to 250 lbs. P.S.I. . . 450° temperature . . . no pressure-reducing valves needed. No soldered, brazed, welded or expanded connections . . . a specially designed threaded nipple provides a leak proof joint (see illustration).

GRID design gives you maximum heating performance because—GRID provides more air changes at lower outlet temperatures . . . carefully selected motor speeds and fan capacities positively deliver warm, comfortable air in ample volume to floor level . . . no wasted heat through stratification.

GRID installations save you money as GRID requires no maintenance . . . is practically self-cleaning (note wide fin spacing in illustration). GRID provides long service life. . . units installed in 1929 are still operating. No ordinary unit heater approaches GRID'S record for continuous trouble-free heating service.



Get the complete story on GRID Unit Heaters, GRID Blast Heaters and GRID Radiation for industrial plant use. Write for your copy today!

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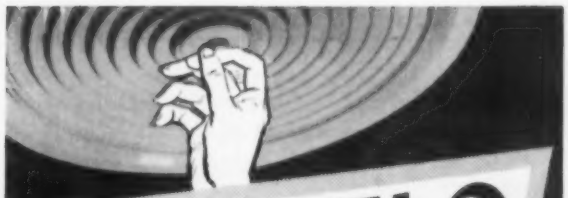
Manufacturers Since 1883 • WAUSAU, WISCONSIN

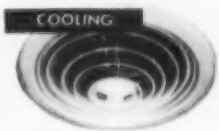


FLEXIFLO

The Diffuser for Every Application

Here's the complete diffuser line with all extra features: built-in equalizing deflectors; easy to install; quick adjustment of air volume and diffusion pattern; simplified engineering; beautifully finished in any color baked enamel.

Let our sales engineers show you why Flexiflo is better for your jobs. But first — get the Flexiflo catalog.

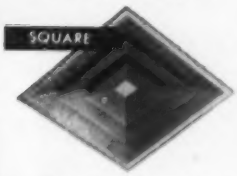


Type R, constant flow pattern regardless of volume adjustment.

Type V, fully adjustable air diffusion pattern and volume.

Type MP, for 1-, 2-, 3- or 4-way diffusion to accommodate any shaped area, 16 styles.

Type CH, adjustable for heating, ventilating and cooling.



Type H, adjustable volume, constant pattern and radius of diffusion.

Type S, side wall or ceiling, with Type R or V blades for heating or cooling.

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38 Marbledale Road, Tuckahoe, N. Y.

Please send me complete catalog HP

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CITY_____ ZONE____ STATE_____

WHO'S WHAT

Continued

▸ *TUBE REDUCING CORP.*—D. L. Watson, manager of new Chicago district office.

▸ *BRISTOL CO.*—R. G. Tower, manager of new western sales office at Denver.

▸ *WORTHINGTON CORP.*—Lawrence P. Brady, national account sales coordinator for air conditioning and refrigeration equipment in New York district office.

▸ *WHIRLPOOL-SEEGER CORP.*—Harold Haff, specialist, refrigeration, for midwestern sales region.

▸ *UNARCO AIR CONDITIONING PRODUCTS, NATIONAL-U.S. RADIATOR CORP.*—William G. Huston, western regional sales manager.

▸ *PENN CONTROLS, INC.*—Newly assigned sales engineers and branches in which they will serve are: Francis Halloran, Boston; Howard Costello, Jr., North Bergen, N.J.; William Marshall, Philadelphia; Harold Swatman, Houston. Mr. Swatman will cover southern Texas and will be attached to the Dallas district office.

▸ *POWERS REGULATOR CO.*—Melvin H. Bird, manager of new branch office at Sioux Falls, S.D.; Ralph Schoverling, transferred to Baltimore to head contract operations. New branch office appointments are: L. A. Wehrheim, branch manager, Wichita; R. E. Stephens, textile specialist, Greensboro; Nathan H. Keller, Nicholas Kies, Robert L. Kiely and Harry F. Kohaut, sales engineers, Dayton, Milwaukee, Philadelphia and New York, respectively. Powers' Houston branch has relocated to 2425 South Blvd., there.

▸ *ALLIS-CHALMERS MFG. CO.*—Carns-Hoaglund Sales Co., distributor of motors, controls to serve air conditioning trade in Arizona.

▸ *KAYE & MacDONALD, INC.*—New manufacturer's agents are: R. H. Langer Engineering Co., Wisconsin; Tennessee Heating Sales Co., Tennessee; H-W Engineering Co., northern California; North-Monsen Co., Utah, Idaho, Nevada, Wyoming.

▸ *PENNSYLVANIA SALT MFG. CO.*—Contract Engineering Co., agent for corrosion resistant products in Arizona, New Mexico, Colorado, Wyoming, west Texas.

▸ *TORK CLOCK CO.*—S. E. Bunn Co., representative for Kansas, western Missouri.

NOW! ...for combined heating-cooling systems

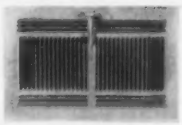
...custom comfort for every room

CEILING AIR DIFFUSERS

Flush or extended models; also dampers and installation rings

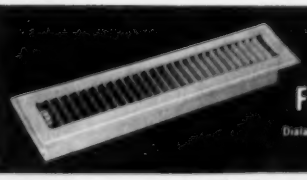
NO. 551 PERIMETER WALL REGISTERS

Fractionator volume control; complete 360° air diffusion.



NEW! B-24 PERIMETER BASEBOARD DIFFUSERS

Adjustamatic finger-tip damper control; built-in damper.



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Diatamatic control; set screw for easy balancing

...with this complete line of Standard Stamping Registers!

These four Standard Stamping Registers enable you to select the air pattern best suited to the size, shape, and use of every room served by a combined heating-cooling system. They're easier to install, trouble free, and give every two-way system perfect air distribution without blasts, hot spots or cold corners! Get the facts about them now!

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HEATING – PLUMBING POWER & PROCESS

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FORGET IT!!!

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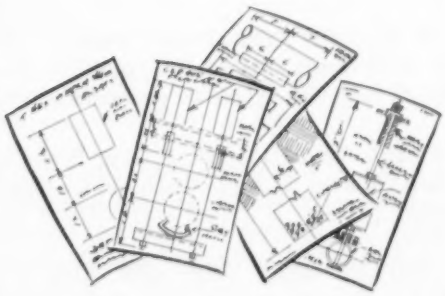

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CARPENTER and PATERSON, Inc.

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NEW FUEL PUMP UNIT Cuts Costs Two Ways

Install TUTHILL TYPE SU V-BELT

Pumping Unit for Lower Original Cost and Reduced Maintenance

The new Tuthill Type SU multiple V-belt pumping units provide structural and performance advantages that save money and insure dependable, uninterrupted operation.

Features like these make the SU outstanding for handling heavy fuel oils in industrial and commercial heating:

- ★ Double savings through low original cost and low maintenance cost.
- ★ One-point belt-tension adjustment.
- ★ Motor mounting provides for motors up to 7½ h.p.
- ★ Fabricated steel base with all bolts and adjustments readily accessible.
- ★ Handles 2 to 4 belts as required.
- ★ Standard pulleys for economy and prompt replaceability.
- ★ Pump, jack shaft and pillow blocks available as separate unit.
- ★ Wide range of capacities and pump models featuring lip-type shaft seal especially designed to eliminate leakage in handling heavy fuel oils.

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Dependable Rotary Pumps . . . since 1927

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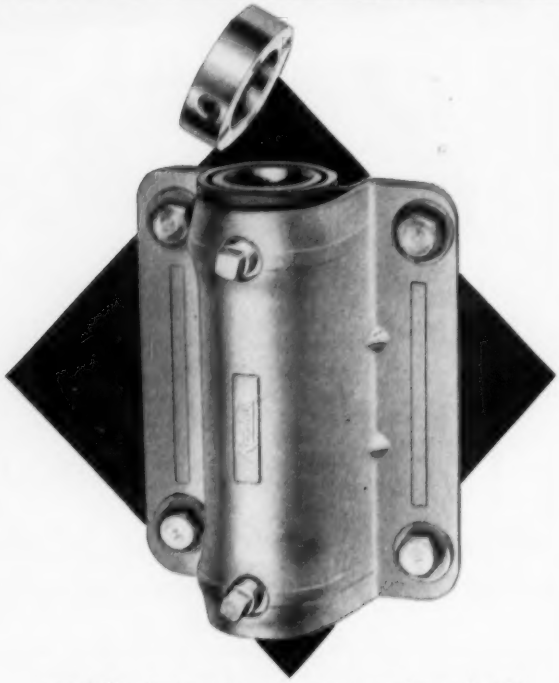
Canadian Affiliate: Ingersoll Machine & Tool Co., Ltd. Ingersoll, Ontario, Canada

"new"
RANDALL
DUPLEX
SLEEVE BEARING ASSEMBLY



specially designed for vertical or thrust loads

The first self-aligning duplex bearing assembly in the low cost field. Now—the *NEW* Randall Duplex Bearing Assembly offers a practical, low cost solution to many vertical or thrust load problems. It is composed of a rugged housing incorporating two Randall graphited bronze bushing "Deep-Well"® ball assemblies. A special graphited flanged bushing and unique thrust collar have been designed for vertical or thrust load applications. Available in ¾" and 1" shaft sizes.

it gives you these outstanding features

The efficiency of this assembly has been proven by extensive testing under all operating conditions.
Completely self-aligning, self-lubricating, quiet in operation.
Pre-lubricated at the factory with Plastic Petroleum E, a long-life lubricant which greatly reduces maintenance.
Long, trouble-free service.
Housing finished in corrosion resisting baked aluminum paint.
Lends itself to simple, low-cost mountings and blends with functional, modern designs.

for horizontal application

Does not require ball assembly with special flanged bushing or thrust collar.
Choice of quality graphited bronze bushings or the low-cost sintered bronze.
Choice of pre-lubricated Plastic Petroleum E, oil or grease style lubrication. Range of shaft sizes ½" to 1".

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PILLOW BLOCKS — SAFETY COLLARS
SHEET LUBRICATOR — BRONZE CASTING

Randall

RANDALL GRAPHITE BEARINGS, INC.
1012 S. Greenlawn Ave., Lima, Ohio

WHO'S WHAT

Continued

▸ *MUELLER BRASS CO.*—George I. Duddy, E. L. Treppa and Vincent A. Bower, district managers of New Orleans, New England and Dallas sales territories, respectively; Milton W. Gkekas, sales representative assigned to Chicago office; Richard C. Haenke, a similar appointment to Detroit office. Mueller has opened a new warehouse to serve the Philadelphia area. F. F. House is district sales manager, assisted by R. B. Miles. James Butler is warehouse manager. He is assisted by C. D. Spencer.

▸ *ORR & SEMBOWER, INC.*—Sales representatives and their territories are: General Equipment Sales, Inc., west Texas, Arizona, New Mexico; Albert F. LaReau, Orange and Ulster Counties, New York; Thermal Engineering Co., Utah, parts of Wyoming and Nevada; Richardson Equipment Co., southern Idaho.

▸ *JOHNS-MANVILLE CORP.*—James G. Walker, northeastern regional sales manager for pipe division; Charles G. Topping, New York area sales manager, succeeding Mr. Walker.

▸ *A. W. CASH CO.*—Erickson Industrial Products Co., north central Texas representative for valves, controllers, governors, regulators, temperature regulators.

▸ *CLARK CONTROLLER CO.*—King D. Christopher, general manager of newly established Los Angeles division.

▸ *AIRTEMP DIV., CHRYSLER CORP.*—George Sharkey, West Coast assistant regional manager.

▸ *McQUAY, INC.*—E. L. Freemire, heating and air conditioning representative for Baltimore, eastern Maryland.

▸ *REFRIGERATION ENGINEERING, INC.*—John T. Harkins Co., distributor for Washington, D.C., Maryland, Virginia; Climate Supply Co., Inc., for Dallas and Tyler, Tex.

▸ *BABCOCK & WILCOX CO.*—Anthony D. Zar, sales representative in charge of Milwaukee district sales office of tubular products division.

▸ *A. M. BYERS CO.*—J. D. Alger Co., wholesale distributor for wrought iron pipe in northwestern Vermont.

▸ *UNARCO AIR CONDITIONING PRODUCTS, NATIONAL-U.S. RADIATOR CORP.*—A. L. Hospers, south-southwest regional sales manager.

WHO'S WHAT

Continued

▸ *WESTINGHOUSE ELECTRIC CORP.*—For Sturtevant Div.: Anthony J. Pandiscio, southwestern regional manager; Charles V. Porter, Boston district manager. For Air Conditioning Div.: Tennessee Engineering Co., distributor for Tennessee, north Georgia, Alabama; Westinghouse Electric Supply Co., for Petersburg, Charlottesville, Richmond, Va., trading areas.

▸ *WOLVERINE TUBE, DIV. OF CALUMET & HECLA, INC.*—Theodore F. Richardson, sales representative appointed by Van D. Clothier, Inc., Wolverine's far west area representative. He will serve northern California.

▸ *BRUNNER MFG. CO.*—Philip E. Bracht, district sales engineer in greater Chicago.

▸ *TUTTLE & BAILEY, DIV. OF ALLIED THERMAL CORP.*—S. Charles Tarnoff, manager of new Chicago office.

▸ *DEAN THERMO-PANEL COIL DIV., DEAN PRODUCTS, INC.*—New representatives and their territories are: Arthur Forsyth Co., most of Washington, part of Idaho, all of Alaska; Jobe & Co., most of Maryland; Charles C. Plummer, Washington, D.C., Virginia; Cotton & Trent Co., south Texas.

▸ *DRAVO CORP.*—Distributors and territories they will cover are: Interstate Air Conditioning Co., 47 South Dakota and 10 Iowa counties; Home Equipment Distributing Co., Iowa counties of Benton, Linn, Iowa, Johnson; Felix J. Commagere, most of Georgia, except for northeast corner.

▸ *TYPHOON AIR CONDITIONING CO., DIV. OF HUPP CORP.*—Les Brosell, district manager to cover California, Arizona, Nevada territories; C. A. Comstock, a similar appointment to cover Florida, southern half of Georgia.

▸ *FEDDERS-QUIGAN CORP.*—New heating representatives: Wm. Berrington & Sons, Inc., Cleveland; Radi-Heat of Kansas, Kansas City, Mo.; Southern Plumbing & Heating Sales Co., Memphis; E. W. Reinertsen, Minneapolis; W. H. Dudley, Jr., New Orleans; Bryant-Williams Co., Pittsburgh.

▸ *BARNEBEY-CHENEY CO.*—F. E. Tapy, sales representative for activated charcoal air purification equipment in Nebraska, western Iowa.

▸ *YOUNG RADIATOR CO.*—James P. Hertz, appointed to Chicago office. ≠

from shops to emporiums —

MT. HAWLEY

BOILER-BURNER UNITS

keep a shopping center comfortable

THE PROBLEM:
Sheridan Village, above, a huge new shopping center, let the subcontract for the heating and air conditioning with one stipulation; each of the 24 stores, regardless of size, was to receive its own individual heating bill. Heat loss figures for the stores varied from well under 100,000 Btuh to over 500,000 Btuh.

THE SOLUTION:
The heating contractor installed two dozen compact Mt. Hawley gas fired Boiler-Burner units. By utilizing a hot water coil to air system, each store regardless of size had its own heating and air conditioning system. Above is a typical installation. The range in sizes was from the Mt. Hawley W-510 with 80,000 Btuh output to the Mt. Hawley A-210 with a capacity of 567,000 Btuh. (Other Mt. Hawley Boiler-Burner units with ranges up to 720,000 Btuh.)

From a cottage to a cathedral . . . a filling station to a field house . . . there's a Mt. Hawley Boiler-Burner unit designed for the job. Clean, space-saving design and efficient, dependable operation make Mt. Hawley the choice for both "run of the mill" installations and those involving special problems.

Today—write, wire or phone Peoria 2-5448 collect for free literature and prices, at no obligation.

MT. HAWLEY FULLY AUTOMATIC OIL BURNERS—A size for any heating need. Efficient . . . long-lived . . . compact . . . silent

MT. HAWLEY MFG. CO

Dept. H-10 Routes 174 & 88 Peoria, Illino

WE HEAR THAT . . .

▸ *MINNEAPOLIS-HONEYWELL REGULATOR CO.* is making preparations to enter the electronic air cleaning field. The company will develop and produce the equipment and will begin marketing activities in the field early in 1957. Manufacturing operations will be carried on at the firm's plant at Wabash, Ind. In the new undertaking, Honeywell will work in cooperation with *TRION, INC.* The two firms have entered into a licensing agreement that provides, among other things, for the exchange of research and engineering information.

▸ *DIAMOND MFG. CO.* has established a new affiliate, *DIAMOND PERFORATING METALS CO.*, at Gardena, Calif. It is said to be the only complete metal perforating plant on the West Coast.

▸ *JAMES L. COLEMAN, JR.*, has formed a new mechanical (heating, piping and air conditioning) contracting firm in Pittsburgh. Offices of the company will be located at 803 Standard Life Bldg.

▸ *OLIN MATHIESON CHEMICAL CORP.* and *REVERE COPPER AND BRASS, INC.* have formed a jointly owned $231 million company to produce 180,000 tons per year of primary aluminum. The company is to be called *OLIN REVERE METALS CORP.* President of the new corporation will be *WALTER F. O'CONNELL*, who will also continue as executive vice president in charge of Olin Mathieson's aluminum program. Ownership of Olin Revere will be on a 50-50 basis.

▸ The name of *GENERAL ELECTRIC CO.'s* Trumbull Components Dept. has been changed to the Circuit Protective Devices Dept. The name was selected as the most descriptive of the kinds of products that this company component manufactures for low voltage electrical distribution systems.

▸ *BALLINGER CO.*, architects and engineers, and *BALLINGER-MESEROLE CO.*, warehouse consultants, held an open house recently at their new two-story office building in Philadelphia. The structure is said to be the first in that area to utilize the air source heat pump.

▸ *DUST SUPPRESSION AND ENGINEERING CO.* has moved to 120 S. Broadway, Lake Orion, Mich. The building houses the company's administrative offices, engineering department and testing laboratory.

▸ *S. YEARDLEY SMITH, INC.*, consulting engineers, has removed its offices to 2426 Maryland Ave., Baltimore.

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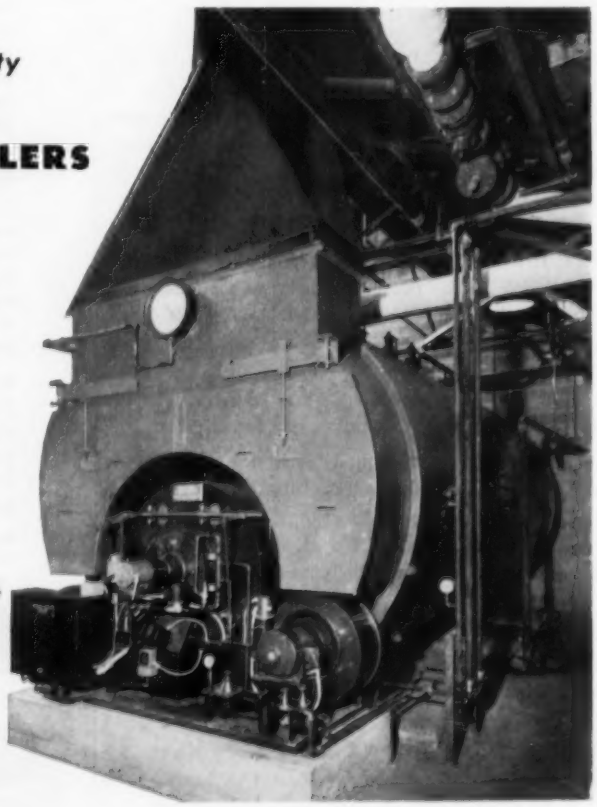
Dependable quality since 1863 . . . . .

POWER BOILERS

Throughout 93 years, Farrar & Trefts has been a leader in boiler design and construction. Today, as in yesteryear, F & T offers dependable, efficient, modern power boilers to satisfy the ever-increasing demands of institutional, apartment, office and industrial buildings. Under the same BISON brand, F & T also furnishes low-pressure boilers for heating purposes.

Proper selection of a boiler for the continuous delivery of required heat and power is a precise project, demanding the systematic approach of engineers long trained in this work. Engineers at F & T have this background of service and they welcome opportunities to evaluate the needs of boiler users.

Standard F & T Suber Scot Power Boiler (150 lb. design pressure) with "Indiana Pack" burner at Mastic Asphalt Corp., South Bend, Ind. Furnished by Page Associates of Chicago. The Austin Co. were the Engineers and Contractors.



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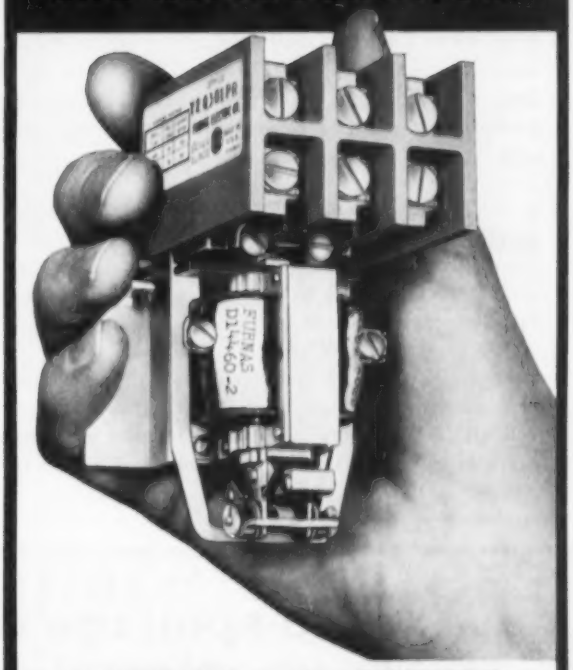
do the best job for AIR CONDITIONING and REFRIGERATION



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For the first time, an ampere size to match your single and polyphase starter requirements for current rated motors through 550 volts. Now you can choose from 20-30-35-50 ampere sizes. Look for these features: 1—Each pole carries full current—no poles connected in parallel. 2—Silver Cadmium Oxide contacts—longer life. 3—Magnets require less watts thereby reducing transformer sizes and thermostat contact load—savings in cost and space.

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A7

FURNAS ELECTRIC COMPANY

BATAVIA, ILLINOIS

Sales Representatives in all Principal Cities

WE HEAR THAT

Continued

▸ *CRANE CO.*, recognizing the potential of nuclear power for military and peacetime use, has set up a new atomic energy unit in its engineering sales section. Headed by *FRED G. GOULD*, the unit will service all inquiries and orders for the company's valves, fittings and other equipment in the atomic energy field.

▸ Construction has begun on an addition to the plant of *AJAX FLEXIBLE COUPLING CO., INC.*, at Westfield, N.Y. The addition will about double the production of dihedral gear type and rubber-bronze bushed couplings and other products, the company says.

▸ *AIRTEMP DIV., CHRYSLER CORP.* is enlarging its air conditioner production facilities with the addition of a new $1,500,000 machine line. At the conclusion of the installation work, Airtemp will start manufacturing three new air conditioner compressors.

▸ Expansion of *NATIONAL HEATER CO., INC.*, into new quarters is virtually complete. The new building will give the company 36,000 sq ft of plant space on a six acre tract. Tentative plans call for further expansion in 1957.

▸ The formation of *COLORADO RESEARCH CORP.*, Dallas, as a subsidiary of *CARRIER CORP.* has been announced. Initially, the new organization will confine itself to the fields of electronics and applied physics. Its services, including model shop facilities, will be available to government and educational institutions as well as to industry. Special work related to air conditioning will be done for Carrier.

▸ Construction has begun on a 100,000 sq ft warehouse for *BRYANT DIV., CARRIER CORP.* The structure, which covers 2¼ acres, is expected to cost about $700,000. It will be located immediately north of the company's manufacturing plant in Indianapolis. Bryant's air dryer department has also moved its sales and engineering staff to that city from Cleveland.

▸ To keep pace with the expanding needs of customers, *WESTINGHOUSE ELECTRIC CORP.* has reorganized its steam division. The newly created departments are: heat transfer apparatus, *A. I. PONOMAREFF*, manager; small turbine, *R. C. TWOMBLY*, manager; large turbine, *L. M. EIKNER*, manager; industrial gas turbine, *R. T. NALLE, JR.*, manager.

▸ In furthering its efforts toward bringing young men of engineering aptitude and ability into industry, *MUELLER CLIMATROL* has embarked on an industrial scholarship development program with the Mil-

"No spoilage due to gaseous contamination since installing Dorex"

... reports R. A. Kempe, Vice President, Metalphoto Corp., Cleveland, Ohio

"We make photosensitive aluminum plates for direct printing of name plates, dials, scales and similar products," says Mr. Kempe. "It used to be that occasionally batches of plates would be chemically fogged—due principally to low concentrations of sulfide gases from neighboring industrial plants.

"Then we installed Dorex Air Recovery, and the trouble vanished. We maintain a slight air pressure within the area where plates are light sensitized, creating an outward air movement. Ventilating air is admitted only through the Dorex activated carbon filters which effectively extract all gaseous contaminants.

"It's now over six months since Dorex went in and not a single plate has been spoiled due to gaseous contamination. We estimate the cost of the complete Dorex installation to be less than half our loss from just one batch of damaged plates."

If you have an air conditioning, air purifying or ventilating problem, let Dorex engineers help you work it out. For full information, write Connor Engineering Corporation, Dept. A-106, Danbury, Conn.

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Capacities of 56 standard and heavy duty models (6 to 30-inches diameter) . . . 140 CFM to 16,766 CFM with or without stacks. Greater capacities on special order.

For Low-Cost Heating Plant Exhausting and Industrial Venting... Investigate *Quickdraft*

★ NO FAN OBSTRUCTION IN EXHAUST LINE
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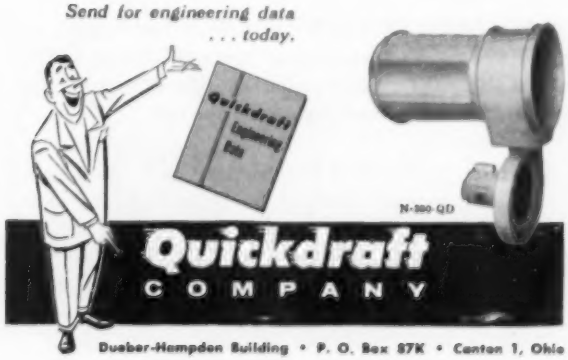
★ CAN BE USED WITH OR WITHOUT STACK

FOR HEATING PLANTS AND INCINERATORS. Quickdraft provides constant draft required for efficient and economical combustion. It prevents noxious concentrations of deadly fumes and dangerous accumulations of explosive gasses from escaping into buildings. It eliminates pulsating or chattering, puffing, smoking and sooting.

FOR INDUSTRIAL VENTING. Quickdraft eliminates down-time for cleaning and replacing fan blades . . . cuts maintenance costs. It is ideal for venting paint booths . . . abrasives, corrosive gasses, noxious fumes, high temperatures and moisture.

FOR MOVING AIR . . . in or out of buildings through ducts . . . Quickdraft is outstanding.

Send for engineering data . . . today.



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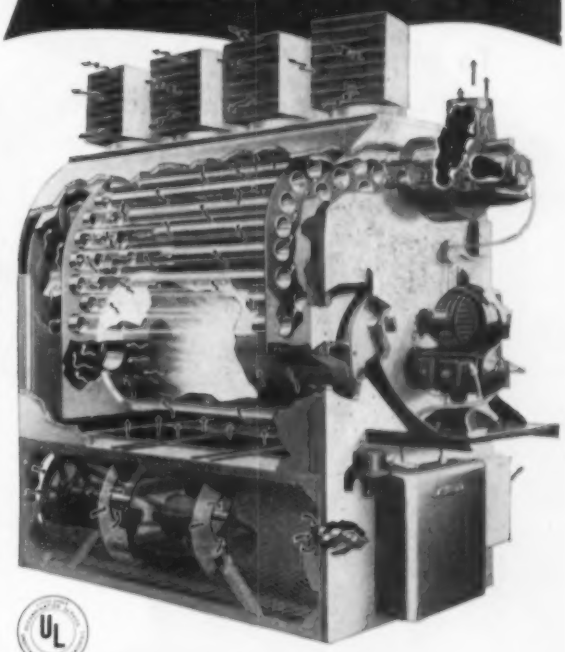

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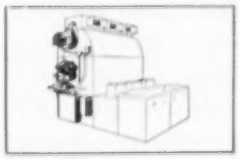
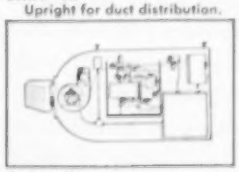
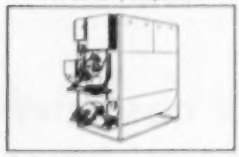
Provides industry with lowest cost heating. Primary cylindrical stainless steel combustion chamber, secondary heat-extracting tubes, consistent rate of combustion gas flow provide high efficiency, utilizing 80% of available heat of fuel. Highly adaptable to desired mounting arrangements. Features low first cost, easy maintenance, complete accessibility to all service points. Completely equipped and wired with controls for economical installation.



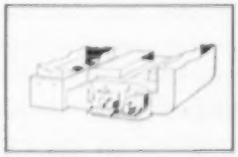
Series "FD"
Upright for duct distribution.



Series "H"
Horizontally suspended.



Series "U"
Inverted suspended.



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Horizontally for duct distribution.

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Send full details, prices, delivery dates, etc., on Commercial-Aire Heaters.

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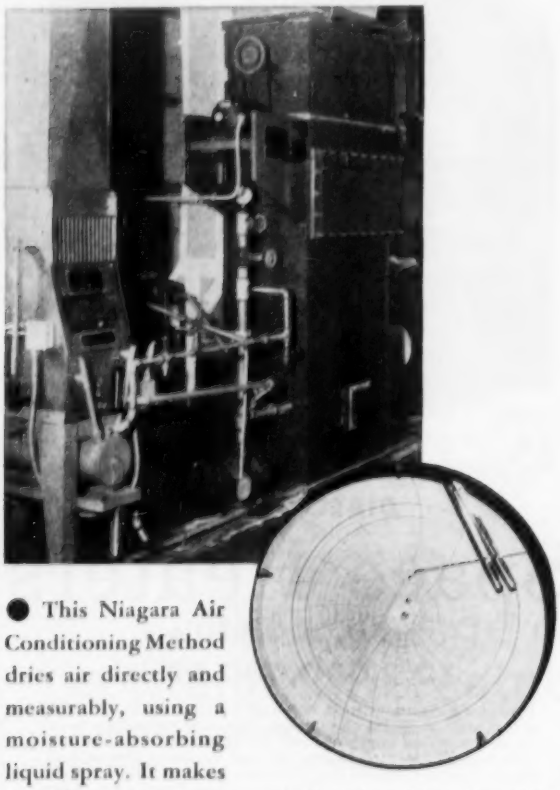
EXACT CONTROL

of Moisture Content

To Improve Your Product or Protect Your Materials or for Processes or Tests



● This Niagara Air Conditioning Method dries air directly and measurably, using a moisture-absorbing liquid spray. It makes humidity control a separate function from lowering or raising temperatures and gives you precise control with thermostats alone; no moisture-sensitive devices are needed. You have simpler, more trustworthy, less expensive control instrumentation. Niagara precise-control installations have the best record for reliability.

Niagara Air Conditioning provides you with any temperature and relative humidity you need. Using "Hygrol" absorbent, it is not expensive to operate, saving the refrigeration commonly used to condense moisture and making re-heat unnecessary in most cases. It gives large capacity with compact, easily-maintained equipment. Ask for Descriptive Bulletins #112 and #121. Address Dept. — HP

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405 Lexington Ave. New York 17, N. Y.

District Engineers in Principal Cities of U. S. and Canada

WE HEAR THAT

Continued

waukee School of Engineering. Each year two promising students in the heating and air conditioning technician school will benefit by a grant-in-aid.

▸ *SQUARE D CO.* will build a $3 million electrical equipment plant on a 29 acre site in Lexington, Ky. The project is scheduled for completion in one year. According to the company, the Lexington plant is included in Square D's $9 million expansion program.

▸ *CARRIER-HOUSTON CORP.'s* new facilities are now operating at full capacity. The recently completed structure provides 33,000 sq ft of warehouse and office space and is designed to meet the requirements of the new distributing organization in serving dealers and contractors in the Houston-Gulf Coast area.

▸ First shipments of flexible metal hose and tubing from *AMERICAN BRASS CO.'s* new $2,500,000 plant plant at Mattoon, Ill., have been announced. The plant was designed to meet the demands of customers in the midwest, southwest and far west. The one-story structure contains 86,000 sq ft of floor space.

▸ *DRAVO CORP.* has been selected by *WESTINGHOUSE ELECTRIC CORP.* as installation contractor for an atomic energy reactor at Shippingport, Beaver County, Pa. The reactor will be the source of heat for a full-scale nuclear powered electric generating plant which is now under construction.

▸ *JOSEPH T. RYERSON & SON, INC.*, plans to build new steel service plants at Charleston, N.C., and Indianapolis. These are to be the 17th and 18th such units in the company's coast-to-coast group.

▸ The Dallas mill depot and sales office of *WOLVERINE TUBE, DIV. OF CALUMET & HECLA, INC.* has been moved to newer and more spacious quarters. The new depot is designed to enable Wolverine to better serve customers in the Dallas area. The company has also recently opened a depot in Miami to serve the Florida territory.

▸ *BARTON INSTRUMENT CORP.*, Los Angeles, will distribute the flow computer line produced by *LIBRASCOPE, INC.*, Commercial Div. The Librascope units will be incorporated into the Barton line.

▸ *C. S. ZIEGLER & CO.* has increased its production due to increased demand for gilsonite in the underground pipe insulation field. The company has completed several new shafts at its "Little Bonanza" and "Little Emma" mines, and has set up centrally located bins equipped with crushers and screens designed to step-up output and provide closer quality control.

here's how you "govern" the government

Much as we revere and respect this system of ours, we don't want the government running our lives.

The best government is one that's closest to the people. And there's just one way to keep it under control.

Vote.

Every time you get a chance.

Vote November 6, for sure.

Vote to elect the ones you want representing you. To keep the ones who are doing you proud. To get rid of the ones who are not so hot.

You're the boss, however you vote. No matter who's elected, you pay their salaries and paint their offices and keep watching over them as they work.

Even if the ones you're "agin" happen to win, they're obligated to the minority, too. They're servants of *all* the people, not just those who voted for them.

Your vote prods, approves, protests, demands, restrains, rewards.

Vote—so you and your children after you always can.

See You at the POLLS!

WE HEAR THAT

Continued

▸ *YOUNGSTOWN SHEET AND TUBE CO.* plans to build a modern, three-story general office building. To be constructed on a 52 acre plot in Youngstown, the facility will be completely air conditioned and will have a floor area of approximately 183,000 sq ft.

▸ New and enlarged copper and brass warehouses have been opened in Long Island City and Cincinnati by *C. G. HUSSEY & CO., DIV. OF COPPER RANGE CO.* The former will serve the New York City area, while the latter will service Louisville and Dayton, in addition to Cincinnati.

▸ A 60,000 sq ft expansion of its *FAMCO, INC.*, plant in Louisville has been reported by *AMERICAN AIR FILTER CO., INC.* Construction is expected to begin this fall with occupancy planned for next May.

▸ *DEMING CO.* has opened a new warehouse at Tyler, Tex. It will be managed by *BEN TURBEVILLE* and he will be assisted by *HOWARD SCOTT McPHEETERS.*

▸ Construction will be started soon on another new "Transite" asbestos-cement pipe plant to be located at Denison, Tex., *JOHNS-MANVILLE CORP.* reports. Production, curing, storage and shipping facilities will cover 350,000 sq ft.

▸ The Department of Wisconsin, Inc., Disabled American Veterans has honored *TRANE CO.* for its program of assisting wounded veterans to rehabilitate. The state DAV presented a citation to the company for its "distinguished service" and "for exceptional and meritorious conduct in the performance of outstanding service for the disabled American veteran.

▸ *ANSUL CHEMICAL CO.* has purchased an existing building at Marinette, Wis. The company will decide soon which departments or operations will be moved to the structure, which will add another 11,000 sq ft of floor space to plant facilities.

▸ *JOSEPH T. RYERSON & SON, INC.* reports that it will sell aluminum produced by *REYNOLDS METALS CO.* in the area served by its New York plant.

▸ Eight awards, worth $1500 each, in *DRAVO CORP.'s* annual $12,000 college and university scholarship program for 1956-57 have been announced.

▸ *ROBERTSHAW THERMOSTAT DIV., ROBERTSHAW-FULTON CONTROLS CO.* has received the top safety award of the Pennsylvania Manufacturers' Association for more than a million man-hours of

For in-slab warm air systems...

Transite* Warm Air Duct
is specified for trouble-free service

Transite Warm Air Duct is easily installed. Its joints are assembled quickly, simply. It never needs anchoring. It easily withstands rough handling and impact of poured concrete. Transite Warm Air Duct resists corrosion. Made of asbestos-cement, Transite's corrosion resistance and long trouble-free life are a matter of record. And, it is priced for competitive bidding. Write today for further information: Address Johns-Manville, Box 14, New York 16, New York. (In Canada, Port Credit, Ontario.)

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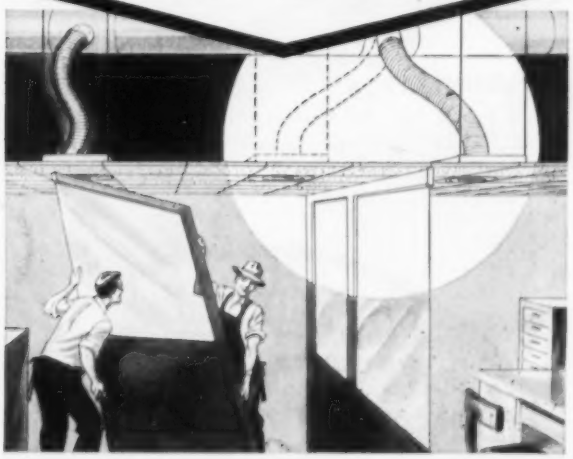
Johns-Manville TRANSITE WARM AIR DUCT
an asbestos-cement product

Relocation of diffusers is easier with WIREMOLD FLEXIBLE AIR DUCT



Save time and labor

...make more profit on the job

Not only is Wiremold Flexible Air Duct *easier* and *faster* for air conditioning installations, it is also *most practical* in modular ceiling installations . . . especially when subdividing and re-partitioning office space. Wiremold Air Duct's *extreme* flexibility makes diffuser relocation possible without disconnecting the duct work.

Wiremold Air Duct is manufactured to very close tolerances—fits snugly on the diffuser outlet. Short lengths can be spliced on the job—saves on waste material.

Write for instruction sheets.

The WIREMOLD Company
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COMBUSTION EQUIPMENT
ENGINEERED By THE WEBSTER ENGINEERING COMPANY

Since 1925 The Webster Engineering Company has devoted its entire efforts to the designing, manufacturing and the applying of modern burner and automatic control equipment.

Webster Burners & Controls

Webster Burners are practically standard equipment with numerous large utilities and every industry where gas and oil are used as fuels.

Webster's facilities permit it to recommend the equipment required to produce the desired results at a reasonable cost. Webster units are not loaded with gadgets.

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Webster's engineers are ready to prepare specifications for any type or size gas and/or oil burning installation.

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FURNAS ELECTRIC CONTROLS

do the best job for AIR CONDITIONING and REFRIGERATION

SAVE WITH "In-Between" SIZES

Instead of just 5 Magnetic Starters in the 1 to 100 hp range, Furnas Electric offers you 9 sizes—the 5 standard sizes plus 4 "in-between" sizes. The many "in-between" sizes in the Furnas Electric line allow you to choose the control that is best suited for your particular job—at a saving to you in cost, space and capacity.

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FURNAS ELECTRIC COMPANY

BATAVIA, ILLINOIS

Sales Representatives in all Principal Cities

WE HEAR THAT

Continued

work without a disabling injury. The award recognizes accident-free work done by approximately 1500 employees of the division.

▸ *JOHN HANCOCK CALLENDER*, architectural consultant, is winner of the first annual stainless steel award, sponsored by *ALLMETAL SCREW PRODUCTS CO., INC.* The award is given for the article judged to be of most value to those who select or buy stainless steel parts or components. The winning entry, *The Design of Stainless Steel Curtain Walls*, brings Mr. Callender $1000 as first prize.

▸ More than 2000 residents of Salem, Ohio, toured the manufacturing plant of *DEMING CO.* during the community's sesquicentennial celebration. Guides explained all operations to the visitors, most of whom are related to Deming employees.

▸ *LEONARD C. KROES*, sales manager of *BRUNDAGE CO.*, returned recently from a week-long seminar at Colgate University conducted by the American Management Association. ⫩

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PRODUCT COOLERS

Units available for any given temperature need, for both wet and dry operation. Water, and hot gas defrost can be furnished. Special problems needing custom engineered units are our specialty.

FLOOR UNIT—(FLOODED AMMONIA)
Water Defrost
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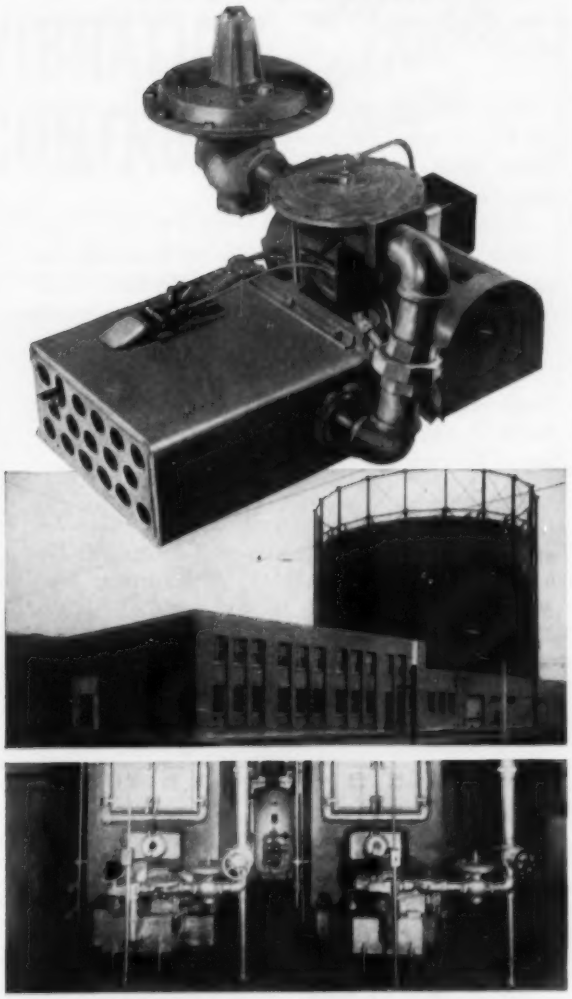
CHICAGO 12, ILL.

HEATING REFRIGERATION • AIR CONDITIONING

LO-BLAST

THE POWER BURNER
Gas Men Choose



Two 2,800,000 BTU Lo-BLAST Burners in service shop building of Peoples Gas Light & Coke Co., Chicago, Illinois. In addition, a Lo-BLAST Economite is used for water heating.

Lo-BLAST costs 10% less to operate—less to install

This burner uses an extremely quiet, low speed blower to provide perfectly controlled primary and secondary air—always independent of natural draft—more efficient and dependable.

A high chimney is not needed and complete factory assembly reduces installation costs. Inshot design reduces maintenance. Each unit is factory tested on gas.

Capacities from 75,000 to 20,000,000 BTU input.
Write for engineering data.

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METAL PRODUCTS CO.
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It's the . . . **Sterlco®**

THERMOTROL

for ACCURATE, INDEPENDENT ROOM TEMPERATURE CONTROL

STEAM *or* HOT WATER SYSTEMS
. . . for modernization or new construction

CAN BE KEY LOCKED

for . . .
HOSPITALS, APARTMENTS, OFFICES, HOTELS, SCHOOLS, MOTELS, INSTITUTIONS and PUBLIC BUILDINGS

- **COMPLETELY SELF-CONTAINED**
  Each Sterlco Thermotrol is a complete temperature control unit, easily installed in any two-pipe system in place of the manual valve. NO wiring or other external connections needed.
- **MODULATING CONTROL—NOT *on* AND *off***
  Each Sterlco Thermotrol provides steady, even control to each radiator the way YOU want it. Radiators in cold spots give off heat while those in warmer parts of the same room are automatically throttled down.
- **NO ELECTRICAL CONNECTIONS**
  No electric wiring, additional piping, or other connections are required with the Sterlco Thermotrol. Just as easily installed for modernization as for new construction.

FOR BUILDING MODERNIZATION

With a Sterlco Thermotrol on each radiator, stuffy overheated rooms, open windows, and excessive fuel bills are eliminated. You pay for only the heat you need . . . rooms are comfortably, evenly warm . . . occupants comfortable.

FOR NEW CONSTRUCTION

Here's modern ZONE CONTROL for radiant systems. The only modern solution to inefficient "on-off" valves and expensive, motorized valves.

STEAM HEATING IS MODERN, EFFICIENT and DEPENDABLE
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MEETINGS & CONVENTIONS

1956

OCT. 15—*Cleaner Air Symposium.* Franklin Institute, Philadelphia. The Institute is at 20th and Parkway, Philadelphia 3.

OCT. 15-17—*American Gas Association,* annual convention. Atlantic City. AGA headquarters: 420 Lexington Ave., New York 17.

OCT. 15-17—*National Association of Corrosion Engineers,* northeast regional meeting. Drake Hotel, Philadelphia. NACE headquarters: 1061 M & M Bldg., Houston 2.

OCT. 22-24—*American Standards Association,* 38th annual meeting, in conjunction with Seventh National Conference on Standards. Hotel Roosevelt, New York. Headquarters: 70 E. 45th St., New York.

OCT. 22-26—*44th National Safety Congress & Exposition.* Chicago. National Safety Council, 425 N. Michigan Ave., Chicago 11.

OCT. 23-26—*National Association of Corrosion Engineers,* south central regional meeting. Gunter Hotel, San Antonio. NACE headquarters: 1061 M&M Bldg., Houston 2.

OCT. 24-27—*Air-Conditioning and Refrigeration Wholesalers,* annual meeting. Jung Hotel, New Orleans. Headquarters: 2607 N. High St., Columbus, Ohio.

OCT. 29-*NOV.* 2—*National Association of Practical Refrigerating Engineers, Inc.,* annual convention. Statler Hotel, Detroit. Headquarters: 435 N. Waller Ave., Chicago 44.

NOV. 8-9—*National Association of Corrosion Engineers,* southeast regional meeting. Charlotte, N. C. NACE headquarters: 1061 M & M Bldg., Houston 2.

NOV. 14-16—*Air Conditioning Institute.* Dept. of Engineering, University of Wisconsin. Information: Ralph D. Smith, coordinator, Extension Div., University of Wisconsin, Madison 6.

NOV. 15-16—*National Association of Corrosion Engineers,* fall meeting of western region. Lafayette Hotel, Long Beach, Calif. NACE headquarters: 1061 M & M Bldg., Houston 2.

Power-Flame
GAS CONVERSION BURNERS
and
COMBI-MATIC
Gas-Oil Combination Burners
The Complete Line...
engineered for every industrial, commercial, domestic application
WITH ALL THESE IMPORTANT FEATURES:
• Completely assembled and factory wired
• 100% forced air for complete combustion
• Dimensional design permits installation without heating plant modification
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• Extremely simple to install and adjust for high efficiency and low operating cost
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In capacities from 450,000 BTU to 18,000,000 BTU input. For industrial applications—large capacities for heating, power, or processing.
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FGO Series—
COMBI-MATIC burners—forced draft gas-oil—6 models for all gases and light oil in capacities to 3,500,000 BTU input. U.L. listed. Changes over from one fuel to the other with automatic or "built in" manual switch.
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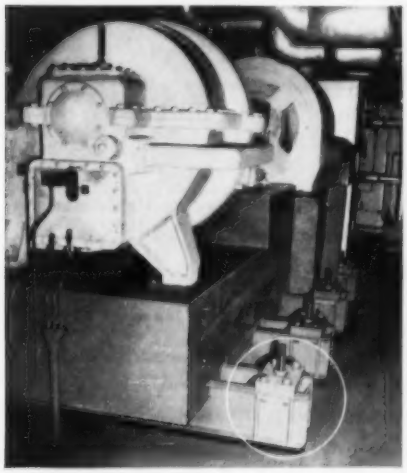

The Cafritz Building, Washington, D. C.
LeRoy L. Weiner *Architect*
William A. Brown *Consulting Engineer*
Cafritz Construction Company *Builder*
Mehring & Hanson Company *Mechanical Contractors*

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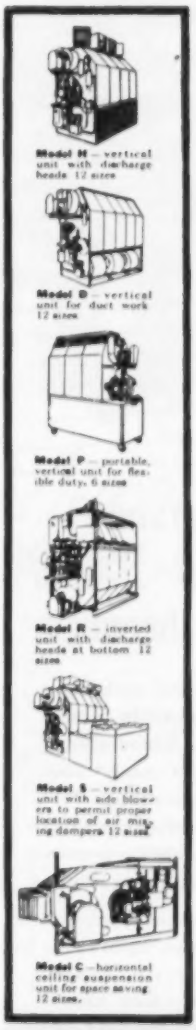

Model H — vertical unit with discharge heads 12 sizes

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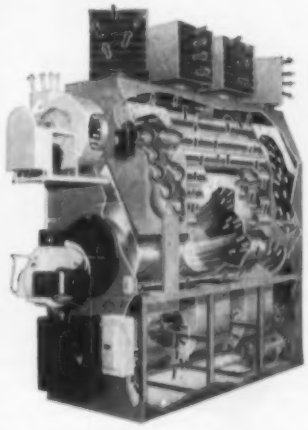

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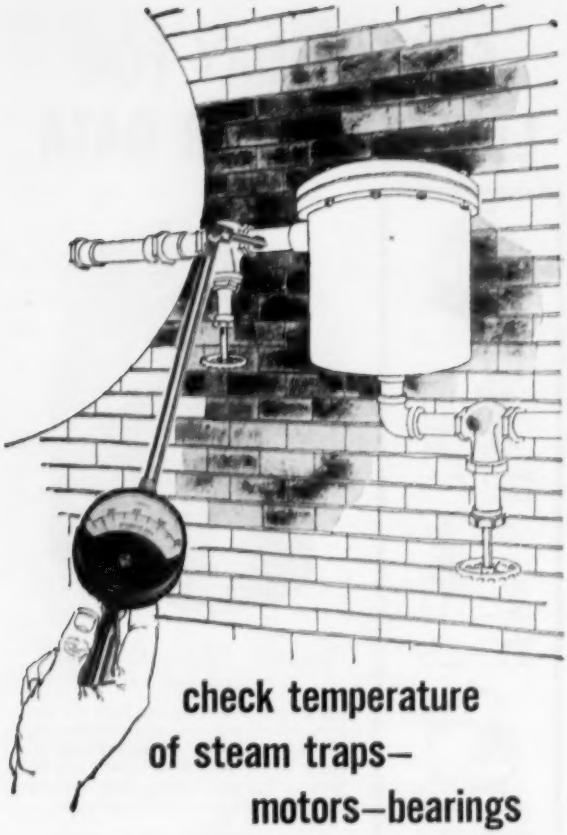

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MEETINGS & CONVENTIONS *Continued*

1956

NOV. 15-16—*Conference on Windows and Glass in the Exterior of Buildings.* U.S. Department of Commerce, Washington, D.C. Conducted by Building Research Instiute, 2101 Constitution Ave., Washington 25, D.C.

NOV. 15-16—*National Association of Corrosion Engineers,* north central regional meeting. Hotel Statler, Detroit. NACE headquarters: 1061 M&M Bldg., Houston 2.

NOV. 15-18—*Refrigeration Service Engineers Society,* annual convention. Hotel Muehlbach, Kansas City, Mo., Headquarters: 435 N. Waller Ave., Chicago.

NOV. 25-28—*American Society of Refrigerating Engineers,* semi-annual meeting. Hotel Statler, Boston. Information: ASRE, 234 Fifth Ave., New York 1.

NOV. 25-30—*American Society of Mechanical Engineers,* annual meeting. Statler Hotel, New York. ASME headquarters: 29 W. 39th St., New York 1.

NOV. 26-29—*Refrigeration and Air Conditioning Contractors Association,* annual convention. Balmoral Hotel, Miami Beach. RACCA headquarters: 10660 Carnegie Ave., Cleveland 6.

NOV. 26-30—22*nd National Exposition of Power and Mechanical Engineering.* Coliseum, New York. Under auspices of American Society of Mechanical Engineers. Manager: E. K. Stevens, care of the Exposition, 480 Lexington Ave., New York 17.

NOV. 26-30—*Third International Automation Exposition.* Trade Show Bldg., New York. Management: Richard Rimbach Assoc., Inc., 845 Ridge Ave., Pittsburgh 12.

NOV 26-30—*National Warm Air Heating and Air Conditioning Association,* committee meetings and annual convention. Netherland Plaza, Cincinnati. NWAHACA headquarters: 640 Engineers Bldg., Cleveland.

NOV. 27-30—*Ninth National Chemical Exposition.* Public Auditorium, Cleveland. Chicago Section of the American Chemical Society, 86 E. Randolph St., Chicago 1.

DEC. 3-5—*Air Pollution Control Association,* semi-annual meeting. Rice Hotel, Houston. Information:

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Unattended uniform heat around the clock . . . . and the cost of heating is sharply reduced with an Olson Heater. Let an Olson representative show you the "black and white" facts on how your plant or warehouse heating can be improved while the cost is reduced.

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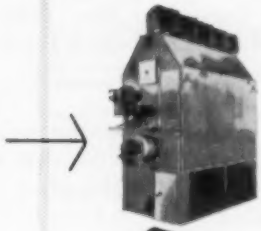

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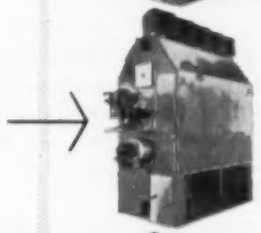
Built solid and tough, designed for easy maintenance. Free from vibration and quiet running. All important adjustments and controls are on the outside within easy sight and reach.



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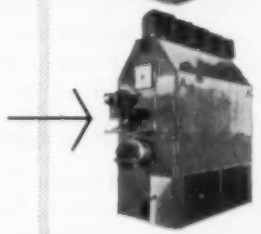
An important feature that eliminates cold air blasts at every start — allows separate control between main blowing fans and exhaust.



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equipped with elbow

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Performance of fans and ventilating equipment installed to exhaust from production and processing areas depends *entirely* upon the availability of ENOUGH AIR! Without sufficient quantities to replace air exhausted, the air-handling system is soon "starved," creating a negative pressure or "vacuum" condition which is responsible for infiltration of outside air around doors and windows. The effect of the resulting draft places an additional work load on the plant heating system, with an ultimate decline in temperatures throughout the working area.

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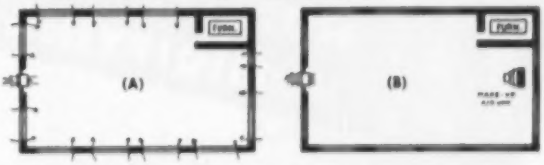

Warm air, exhausted from a machine shop area, replaced by cold air pulled through cracks and door openings (A). Filtered and tempered air, supplied by Make-Up Air Unit installed in same area (B) helps to maintain constant temperatures; levels-off "peaks" and "valleys" in boiler or furnace loading.

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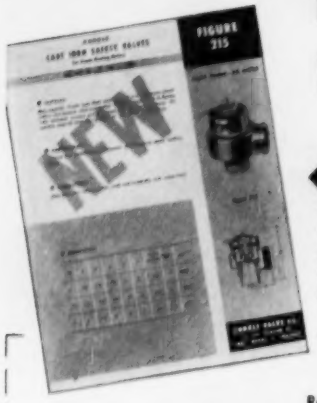

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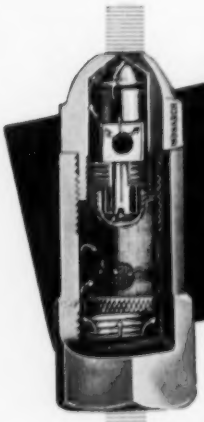

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MEETINGS & CONVENTIONS *Continued*

1956

Harry C. Ballman, executive secretary, APCA, 4400 Fifth Ave., Pittsburgh 13.

1957

JAN. 28-31—*Eighth National Plant Maintenance & Engineering Show.* Public Auditorium, Cleveland. Information: Clapp & Poliak, Inc., 341 Madison Ave., New York 17.

FEB. 4-8—*American Society for Testing Materials,* committee week. Benjamin Franklin Hotel, Philadelphia. ASTM headquarters: 1916 Race St., Philadelphia 3.

FEB. 8-10—*Air Conditioning, Ventilating and Electric Space Heating Exposition.* Sheraton Park Hotel, Washington, D.C. Conducted by the Electric Institute of Washington, 10th and E Sts., N.W., Washington 4, D.C.

FEB. 18-21—*Sixth Annual Industrial Ventilation Conference.* Kellogg Center, Michigan State University. Information: Industrial Ventilation Conference, Continuing Education Service, Michigan State University, East Lansing, Mich.

FEB. 25-28—*American Society of Heating and Air-Conditioning Engineers, Inc.,* 63rd annual meeting. Conrad Hilton Hotel, Chicago. Information: A. V. Hutchinson, executive secretary, ASHAE, 62 Worth St., New York 13.

FEB. 25-*MARCH* 1—*13th International Heating and Air-Conditioning Exposition.* International Amphitheater, Chicago. Under management of International Exposition Co., 480 Lexington Ave., New York 17.

MARCH 11-15—*National Association of Corrosion Engineers,* annual conference and exhibition. Kiel Auditorium, St. Louis. NACE headquarters: 1061 M&M Bldg., Houston 2.

MARCH 18-21—*Society of the Plastics Industry,* annual national conference and Pacific Coast plastics exposition. Hotel Biltmore and Shrine Exposition Hall, Los Angeles. SPI headquarters: 250 Park Ave., New York 17.

MARCH 27-29—*19th Annual American Power Conference.* Hotel Sherman, Chicago. Information: Illinois Institute of Technology, 35 W. 33rd St., Chicago.

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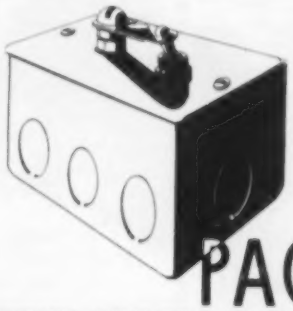

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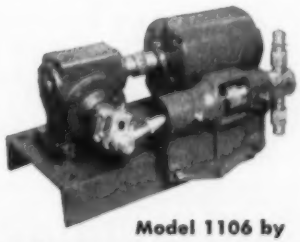

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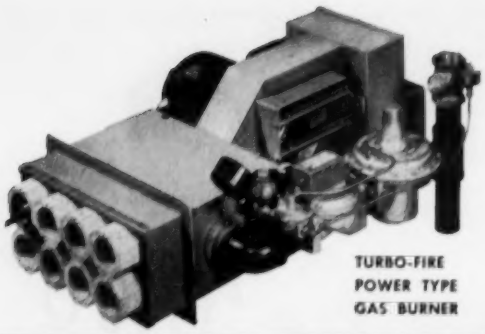

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−10° to + 50°F 24 Hours
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40° to 100°F 24 Hours
60° to 160°F 24 Hours
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MEETINGS & CONVENTIONS *Continued*

1957

APRIL 14-17—*Building Research Institute*, annual meeting. Edgewater Beach Hotel, Chicago. BRI headquarters: 2101 Constitution Ave., Washington 25, D.C.

MAY 6-8—*Air-Conditioning and Refrigeration Institute*, annual meeting. The Homestead, Hot Springs, Va. ARI headquarters: 1346 Connecticut Ave., N.W., Washington 6, D.C.

MAY 7-10—*Mechanical Contractors Association of America*, annual meeting. Hotel Fontainebleau, Miami Beach. The association is at 30 Rockefeller Plaza, New York 20.

JUNE 2-5—*American Society of Refrigerating Engineers*, annual meeting. Hotel Fontainebleau, Miami Beach. ASRE headquarters: 234 Fifth Ave., New York.

JUNE 3-6—*National District Heating Association*, 44th annual meeting. The Homestead, Hot Springs, Va. NDHA headquarters: 827 N. Euclid Ave., Pittsburgh.

JUNE 16-21—*American Society for Testing Materials*. Chalfonte-Haddon Hall, Atlantic City. ASTM headquarters: 1916 Race St., Philadelphia 3.

JUNE 24-27—*American Society of Heating and Air-Conditioning Engineers, Inc.*, semi-annual meeting. Murray Bay, Quebec. Information: A. V. Hutchinson, executive secretary, ASHAE, 62 Worth St., New York 13.

OCT. 7-9—*American Gas Association*, annual convention. Kiel Auditorium, St. Louis. AGA headquarters: 420 Lexington Ave., New York 17.

NOV. 14-16—*American Society of Refrigerating Engineers*, semi-annual meeting. Morrison Hotel, Chicago. ASRE headquarters: 234 Fifth Ave., New York.

NOV. 18-21—*10th Exposition of the Air-Conditioning and Refrigeration Industry*. International Amphitheater, Chicago. Air-Conditioning and Refrigeration Institute, 1346 Connecticut Ave., N.W., Washington 6, D.C.

NOV. 18-22—*National Warm Air Heating and Air Conditioning Association*, committee meetings and annual convention. Morrison Hotel, Chicago. NWAHACA headquarters: 640 Engineers Building, Cleveland 14.

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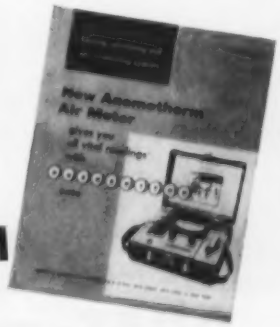

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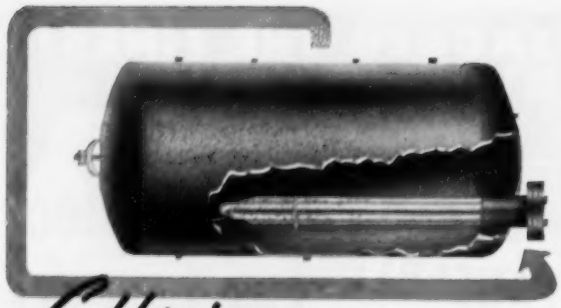

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1956 Heat Transfer and Fluid Mechanics Institute—Reprints of papers. Stanford University Press, Stanford, Calif. $5.75.

Elevated-Temperature Properties of Coppers and Copper-Base Alloys—ASTM special technical publication No. 181. 248 pp. American Society for Testing Materials, 1916 Race St., Philadelphia 3. $5.50.

Engineering Study of Air Conditioning Load Requirements for Aircraft Compartments—177 pp. Publication PB 121139. Office of Technical Services, U.S. Department of Commerce, Washington 25, D.C. $4.50.

Study of Combustion and Heat Transfer Fundamentals in Small Diameter Tubes—AGA research report No. 1255. By Forrest G. Hammaker, Jr., and Thomas E. Hampel. American Gas Association Laboratories, 1032 E. 62nd St., Cleveland 3. $1.00.

Directory of the Members of the American Standards Association—63 pp. American Standards Association, 70 E. 45th St., New York 17, N.Y. Free.

ARI Standard 530—Application engineering standard for air conditioning multizone buildings. Air-Conditioning and Refrigeration Institute, 1346 Connecticut Ave., N.W., Washington 6, D.C.

Simplified Practice Recommendation R179-56, Insulating Board (Wood or Other Vegetable Fiber)—Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C. 5c.

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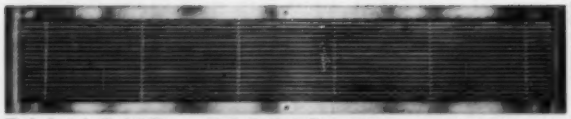

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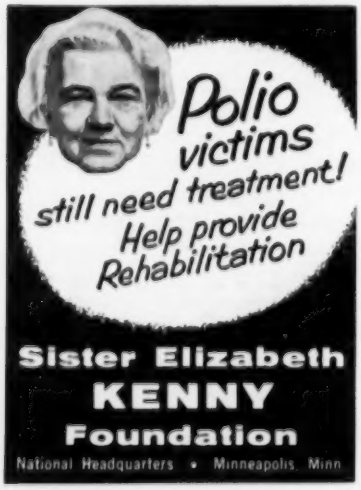

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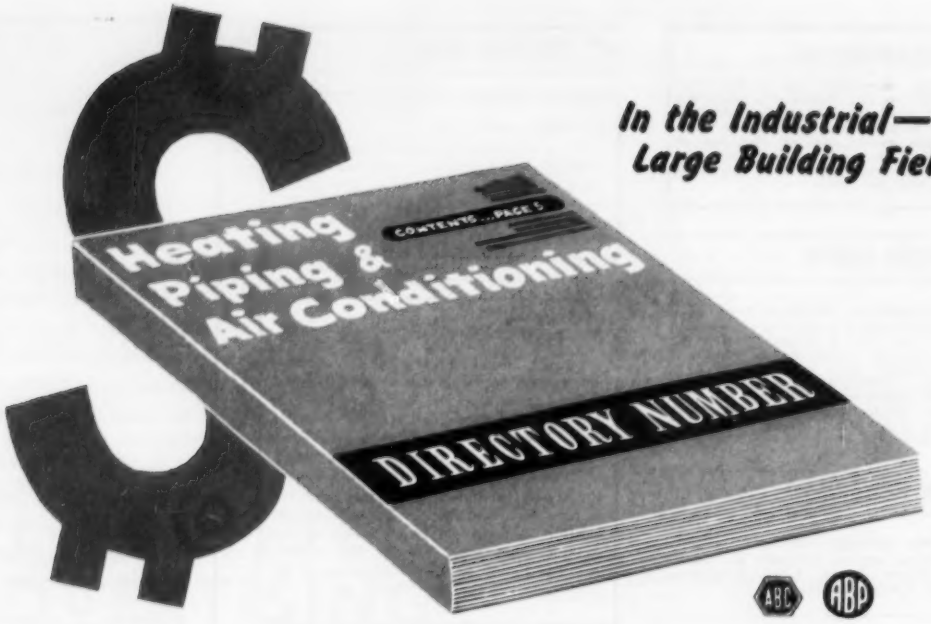

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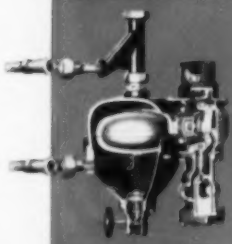

No. 47-2 Quick-Hook-Up Feeder Cut-off Combination for automatically fired steam boilers up to 5000 ft.; maximum steam pressure, 25 lbs. Other types for larger boilers and higher pressure; also for hot water space heating boilers.

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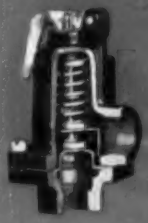

230 series ASME pressure relief valves for hot water space heating boilers; for hot water tanks and heaters. Tested and Btu-rated by National Board of Boiler and Pressure Vessel Inspectors. Also temperature relief valves and P-T relief valves.

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